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ABSTRACT

Project Special Elementary Education for the Disadvantaged (SEED) was implemented during 1986-87 and 1987-88 in 18 fourth- and fifth-grade classrooms in 8 of the Portland (Oregon) Public Schools to increase students' esteem for math learning and to improve mathematics achievement. It is a supplementary mathematics program applying Socratic discovery method to mathematics instruction. The program's implementation was evaluated, and information about student attitudes was collected to supplement student achievement data. Each year, participation ranged from 5 to 24 weeks. Classroom instructors gave up one-fourth of their instructional time to SEED specialists. Although SEED instruction doubled time for mathematics, achievement was not notable, with gains comparable among SEED and non-SEED students. The responses of 68 fifth and 29 fourth graders show that both groups enjoyed the SEED experience. Their responses about math were more positive than were those of non-participants. All 8 principals were interviewed in both years. Of the 18 teachers sampled, 16 in 1986-87 and 15 in 1987-88 were interviewed. Administrators and teachers expressed concern about the lack of integration of SEED with the regular curriculum. Follow-up of 420 SEED graduates indicated that a smaller proportion of them participated in advanced programs in middle school. Outcome data warranted neither expansion nor continuation of the program. Data are presented in three tables. Principal, teacher, and student questionnaires; achievement graphs; and an observation checklist are appended. (SLD)

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# 1987-88 Evaluation Report

# PROJECT SEED

# IN THE PORTLAND PUBLIC SCHOOLS

## Report on Years Three and Four: 1986-87 and 1987-88

Research and Evaluation Dept.
Portland Public Schools
Portland, Oregon
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June 1988

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TM 012 472

# EVALUATION REPORT

## PROJECT SEED, 1986-87 and 1987-88

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Portland, Oregon

June, 1988

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## ADMINISTRATIVE SUMMARY

Project SEED is a supplementary math program which applies Socratic discovery methods to math instruction. The program was implemented during 1986-87 and 1987-88 in 18 fourth and fifth grade classrooms in eight schools to increase students' esteem for math learning and to improve mathematics achievement. An evaluation was conducted to document the implementation, to collect information on Project SEED students' attitudes toward mathematics, and to report student achievement outcomes.

The phased-in implementation favored by SEED resulted in a wide variation in the number of weeks students participated in the Project; each year, participation ranged from five weeks to 24 weeks, though there were more classes lasting more than a semester during 1987-88. The SEED-preferred 45-minute class period doubled students' time for math instruction. Classroom teachers gave up a fourth of their whole-group instruction time four days a week so that the SEED specialists could conduct their program. Teachers reported that they took time from language arts, the regular math program, and science. Teachers reported that the Project made two program adjustments during 1986-87 and 1987-88: specialist assignments and/or schedules were changed upon school request, and specialists included lessons in fractions within the SEED curriculum.

While students were in SEED, their instructional time for math was doubled, but their achievement has not been notable. SEED students have typically made gains comparable to those of non-SEED students in the District and in the project schools. SEED only students have consistently gained less than low-achieving students in the project schools who participate in Chapter 1 math programs.

Student responses to the 1986-87 Attitude Toward Math survey were mixed. All of the Portland Public School fourth graders who were surveyed (both SEED and non-SEED) responded more positively on the survey than the age-nine norming group. Responses of the non-SEED fourth graders were typically more positive

than responses of the SEED students. There were no comparative norms for grade five. SEED fifth-graders responded more positively than non-SEED students. A summary of responses to the 1987-88 Student Interview Questionnaire indicated that fourth and fifth graders enjoyed the SEED learning experience. Students typically explained that SEED differed from the regular math program because it emphasized exponentiation, but they were unable to explain much about exponentiation other than that "E means times." A third of the respondents reported that both regular and SEED classes emphasized fractions.

Follow-up studies of SEED graduates indicates that when SEED and non-SEED students are compared, a smaller proportion of SEED students are in middle school advanced math classes and/or in the District's MESA program.

Outcome data warrant neither an expansion nor a continuation of the program. This evaluation documents for the third year that doubling instructional time in mathematics with Project SEED produces neither appreciable change in attitude, nor important achievement growth.

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## INTRODUCTION

Project SEED (Special Elementary Education for the Disadvantaged) is a supplemental math program which applies guided discovery methods to math instruction. Designed for use with educationally disadvantaged children K through 12, with an emphasis on grades 3-6, SEED purports to improve math achievement scores and at the same time to contribute to students' positive self-concepts about learning mathematics.

Project SEED has been in the Portland Public Schools since 1984. With the exception of the first year which was devoted to teacher orientation, the program has been implemented in eight elementary schools in the Jefferson and Grant Clusters. A previous evaluation was conducted on the 1985-86 program implementation.

This report documents the 1986-87 and 1987-88 SEED implementation, presents teacher and principal perceptions of the Project in operation, describes the nature and extent of student participation in SEED classes, and reports student outcomes in terms of achievement, attitude toward math, and participation in advanced math programs and classes during middle school.

## PROGRAM DESCRIPTION

The SEED curriculum is different from the regular mathematics program; Project SEED provides an algebra-like math curriculum which focuses extensively on exponentiation. Specialists are trained by the project to use guided discovery questioning methods and a variety of program-specific student interaction techniques. Specialists teach three or four hours per day (four 45 minute classes) four days a week. On the fifth day, the specialists typically observe one another teaching as a form of continuous inservice for the SEED staff. SEED staff also work to recruit community business personnel and to train them as volunteer specialists for short-term classroom instruction.

SEED is conducted with whole-class student groups of all ability levels. It is not a pull-out program. SEED instruction is delivered by SEED specialists for 45 minutes a day, four days a week in addition to the regular mathematics program. The Project assumes that regular classroom teachers do not have sufficient math training to teach SEED, but that observations of the specialists at work may be useful to display techniques for increasing students' classroom participation and also to increase teachers' expectations of students' learning ability, particularly in mathematics.

## EVALUATION

The Directors of Instruction in the Jefferson and Grant Clusters requested the services of the Department of Research and Evaluation to conduct a second and third-year evaluation of Project SEED. Both teachers and principals reported three objectives for student participation in SEED: 1) improved self-esteem and positive attitudes for math learning, 2) increased opportunities to develop thinking skills, and 3) improved math achievement. The evaluation was intended to document the implementation, to describe the nature and extent of student participation during Project SEED instruction, and to answer these questions:

- What are math achievement outcomes for Project SEED students?
- What are Project SEED students' attitudes toward math?
- How extensive is the SEED graduates' participation in advanced math courses?

In order to document the SEED implementation, the SEED contract and service plan were summarized and compared with information collected from program documents and interviews with principals and teachers whose classes participated in the program. All eight SEED school principals were interviewed during both evaluation years. In 1986-87, sixteen of eighteen participating teachers were interviewed -- one was on leave and another had participated in the program for only two weeks at the time the interviews were

scheduled. In 1987-88, fifteen of eighteen teachers were interviewed -- two teachers in a year-round school were on vacation and one other teacher had a scheduling conflict. Copies of the "Principal Interview Questionnaire," "Interview Questionnaire for Teachers," and response summaries for both surveys are in Appendix A. The evaluator developed a "Project SEED Observation Checklist" to document student participation during SEED classes. A copy of the checklist is in Appendix B.

Fall to spring achievement growth on the Portland Achievement Levels Test (PALT) in mathematics was analyzed for groups which participated in SEED. SEED students' achievement growth was compared with that of other groups in SEED schools and in the District who began the year at comparable achievement levels. Data for two classes were not included in the achievement analysis and interpretation in either the 1986-87 or 1987-88 evaluations because the classes operate on a year-round instructional program and the fall to spring growth is not directly comparable.

In 1986-87, the "Attitude Toward Mathematics" survey questionnaire was administered to fourth and fifth grade students in Project SEED schools and in neighboring elementary schools in the Jefferson Cluster. The "Attitude Toward Mathematics" survey was prepared for the 1977-78 National Assessment of Educational Progress (NAEP), and has been used to assess affect for math in a previous evaluation of Project SEED. A copy of the survey and related technical information provided from NAEP documents is in Appendix D. In 1987-88 the evaluator interviewed 89 Project SEED students in fifteen long-term classes. Two classes were on vacation from their year-round program when interviews were conducted, and a third class had scheduling conflicts. The "Student Interview Questionnaire" is described in Appendix D.

## THE 1986-87 AND 1987-88 PROJECT SEED IMPLEMENTATION

During 1986-87, Project SEED contracted with the Portland Public Schools to provide instruction in each of nine fourth and fifth grade classes and orientation for a minimum of 20 District teachers and/or support staff. During 1987-88, the Project contracted to provide long-term instruction at one class in each of the eight participating schools, and to offer inservice

training and materials to teachers new to SEED schools. The Project Service Plans outlined SEED's intent to continue recruitment and training of corporate volunteers, to remain in regular communication with principals, and to make program adjustments to better serve student and staff needs. It was a Project SEED goal to have four trained corporate volunteers teach one semester each during 1986-87 school year, and to continue corporate volunteer involvement during 1987-88.

Long-Term Classes

Project SEED prefers to work for 45 minutes a day, four days a week in classrooms where students are heterogeneously grouped for math instruction, where teachers have volunteered their participation, and where discipline problems are at a minimum. In half of the eight SEED schools, teachers volunteered to participate in the project and in the other schools, principals requested teacher participation. All of the participating classes were heterogeneously grouped for SEED instruction. Because participating teachers had an average of three hours of whole-group instruction each day, on the four days that SEED was implemented, regular whole-group instruction was cut by a fourth. Teachers reported that they took time for SEED from language arts, the regular math program, and science.

SEED prefers a phased-in implementation which allows the SEED specialist to become comfortable with each class before beginning a new one. This results in participating classes receiving varied amounts of instruction during different parts of the school year. Table 1 presents the 1986-87 and 1987-88 classes and the duration of their SEED instruction. Varied start dates reflect the phasing-in approach. A total of 438 students participated in the program during 1986-87 and an identical number participated during 1987-88. Approximately 60% of the 1986-87 students were fourth graders and 40% were in grade 5. In 1987-88, 30% of the SEED students were fourth graders and 70% were in grade 5.

Table 1
Duration of Long-Term SEED Classes, 1986-87 and 1987-88

| Grade Level | Start Date | Duration of Program in Weeks | SEED Specialist | Number of Students Served |
|---|---|---|---|---|
| 4 | 10-24-86 | 7 | A | 22 |
| 4 | 09-30-86 | 24 | C | 27 |
| 4 | 09-24-86 | 24 | B | 29 |
| 4 | 10-28-86 | 21 | C | 22 |
| 4 | 11-12-86 | 19 | A | 21 |
| 4 | 12-03-86 | 18 | B | 23 |
| 4 | 02-02-87 | 9 | Volunteer | 28 |
| 4 | 02-05-87 | 13 | A | 26 |
| 4 | 02-02-87 | 13 | B | 23 |
| 4 | 03-09-87 | 5 | Volunteer | 8* |
| 4 | 03-30-87 | 5 | A | 29 |
| 5 | 09-24-86 | 11 | C | 30 |
| 5 | 09-29-86 | 24 | C | 20 |
| 5 | 10-06-86 | 10 | B | 24 |
| 5 | 11-03-86 | 17 | A | 27 |
| 5 | 01-16-87 | 15 | B/Volunteer | 26 |
| 5 | 02-04-87 | 13 | C | 23 |
| 5 | 02-03-87 | 8 | Volunteer | 30 |
| TOTAL 1986-87: | | | | 438 |
| 4 | 10-12-87 | 24 | C | 24 |
| 4 | 10-27-87 | 6 | Volunteer | 28 |
| 4 | 10-28-87 | 8 | Volunteer | 28 |
| 4 | 10-29-87 | 22 | B | 24 |
| 4/5 | 10-05-87 | 24 | B | 29 |
| 4/5 | 01-19-88 | 14 | Volunteer | 26 |
| 5 | 09-28-87 | 26 | C | 24 |
| 5 | 09-30-87 | 26 | A | 26 |
| 5 | 09-30-87 | 9 | C | 21 |
| 5 | 10-07-87 | 8 | A | 22 |
| 5 | 10-13-87 | 24 | A | 23 |
| 5 | 10-19-87 | 23 | C | 26 |
| 5 | 10-26-87 | 22 | B | 26 |
| 5 | 10-28-88 | 22 | B | 22 |
| 5 | 11-17-87 | 20 | C | 22 |
| 5 | 01-06-88 | 15 | C | 25 |
| 5 | 01-19-88 | 14 | A | 20 |
| 5 | 02-22-88 | 10 | A | 22 |
| TOTAL 1987-88: | | | | 438 |

*This was a third/fourth grade split; eight students were fourth graders.

Project SEED provided instruction in 18 classes each during both 1986-87 and 1987-88. SEED instruction ranged from five to 24 weeks. Approximately 45% of the classes (n=16) spent the equivalent of a semester or more in SEED; 31% (n=11) were in SEED the equivalent of a quarter, and 25% (n=9) participated in SEED for nine weeks or less. For each five days in SEED, students spent an average of 225 minutes in the program in addition to approximately 225 minutes in their regular math class; while they were in SEED, students' mathematics instructional time was virtually doubled. Students in other supplementary math programs typically spend less time in the support program, e.g., Chapter 1 math students averaged 150 minutes for each five days of treatment.

Table 2 describes the long-term presence of Project SEED in each school during 1986-87 and 1987-88. On average, SEED was present in the project schools for nearly the whole school year.

Table 2
Long-Term Presence in Project SEED Schools and
Number of Students Served
1986-87 and 1987-88

| School | Start Date | Ending Date | Number Served | | Total |
|---|---|---|---|---|---|
| | | | Grade 4 | Grade 5 | |
| Boise-Eliot | 12-03-86 | 06-05-87 | 23 | -- | 23 |
| Humboldt | 09-30-86 | 06-05-87 | 92 | 26 | 118 |
| Irvington | 09-29-86 | 06-05-87 | -- | 20 | 20 |
| King | 09-24-86 | 06-05-87 | 62 | 60 | 122 |
| Peninsula | 11-03-86 | 05-08-87 | 29 | 27 | 56 |
| Sabin | 02-04-86 | 06-05-87 | -- | 23 | 23 |
| Vernon | 09-24-86 | 06-05-87 | 29 | -- | 29 |
| Woodlawn | 10-06-86 | 06-05-87 | 23 | 24 | 47 |
| Total 1986-87: | | | 258 | 180 | 438 |
| Boise-Eliot | 09-30-87 | 06-10-88 | -- | 41 | 41 |
| Humboldt | 09-28-87 | 06-10-88 | 48 | 68 | 116 |
| Irvington | 11-17-87 | 06-10-88 | -- | 22 | 22 |
| King | 09-30-87 | 06-10-88 | 74 | 60 | 134 |
| Peninsula | 10-19-87 | 06-10-88 | -- | 51 | 51 |
| Sabin | 10-13-87 | 06-10-88 | -- | 23 | 23 |
| Vernon | 10-05-87 | 06-10-88 | 15 | 14 | 29 |
| Woodlawn | 10-28-87 | 06-10-88 | -- | 22 | 22 |
| Total 1987-88: | | | 137 | 301 | 438 |

## Teacher Orientation

Project SEED orientation acquaints teachers with the program in operation in their own classrooms and encourages them to volunteer their classes for participation. Orientation lasts from three days to three weeks. The 1986-87 SEED contract called for an orientation of 20 staff. SEED specialists oriented 11 fourth and fifth grade teachers in the participating schools, six of whom had been oriented before. The contract objective of orienting 20 staff may have been an unreasonable goal because SEED has been in the District for three years and most of the teachers in the participating schools have already been oriented. During 1987-88 SEED planned to orient teachers new to Project schools. SEED oriented three new teachers and a fourth teacher participated in the orientation a second time.

To date, SEED has oriented 68 teachers to the project since 1985 (six were oriented twice). Twenty-two of the oriented teachers (32%) have had SEED in their classrooms. Two teachers have participated in SEED for three years, twelve participated twice, and 20 other teachers have participated for one year. To fulfill school commitments to the implementation, 12 non-oriented teachers have also had the program in their classrooms.

## Corporate Volunteers

The Project has trained seven corporate volunteers through observation of SEED classes and four hours of small-group consultation about philosophy, methods, class management, curriculum and instructional strategies. Four volunteers taught SEED classes (which lasted from five to nine weeks) during the 1986-87 school year and three other volunteers taught during 1987-88 (from six to 14 weeks). Only one volunteer came close to meeting the project goal of teaching for a semester. The rest have taught for shorter periods of time. None of the volunteers has repeated his or her participation in the program.

Communication with Administration and Teachers

SEED specialists maintained on-going communication with District administrators, school principals, teachers and support staff. Specialists were available to talk about Project SEED with parents during fall conferences. Specialists also attended school functions such as plays, cultural fairs and field trips.

Teachers reported that they spent an average of 15 minutes a week in informal planning conversations with the SEED specialists. Five teachers reported no communication and one described the frequency of communication as "four or five times" during the school year. Conversations were held after SEED classes, before and after school, or during teacher preparation periods. The 15-minute average was half the amount of planning time spent with SEED during 1985-86. One possible explanation is that the larger number of classes during 1986-87 and 1987-88 years allowed specialists less time for consultation. Another explanation is that regular teachers were unwilling to give up regular planning time as part of their participation in SEED.

Program Adjustments

The first year evaluation of Project SEED documented teacher and principal concerns about the lack of integration between the regular math program and the SEED curriculum. Teachers and principals continued to voice their concerns about the poor alignment between the two curricula, though teachers reported that SEED specialists included more fractions instruction during 1986-87 and 1987-88. Scheduling changes were mentioned as the most common form of program adjustment.

## THE NATURE OF STUDENT PARTICIPATION IN PROJECT SEED

Observations were conducted in fifteen Project SEED classes (304 students were in attendance) during the spring of 1987 to document the nature and extent of student participation in SEED classes. The quality of participation was examined because it was expected that the student-teacher interactions would provide opportunities for students to display higher-level thinking skills. Each observation period began ten to fifteen minutes after the class started and lasted approximately 25 minutes. During the first ten minutes, the evaluator made a record of the curriculum presented and used a class seating chart to identify individual students in attendance. During the next fifteen minutes, specialist techniques, and related student responses were coded. A "Project SEED Observation Checklist" was developed from field-notes taken during the previous year's evaluation, and from the Curriculum and Methodology unit of the Project SEED notebook. A copy of the checklist is in Appendix C. Individual student responses were tallied and categorized according to content. Whole-group verbal responses were categorized according to content.

### Curriculum Content

During classroom observations, the SEED curriculum most often emphasized exponentiation and fractions; a quarter of the time, exponentiation was the focus and a quarter of the time the students worked on fractions. The rest of the time, content was typically divided among presentations and discussions of inverse operations, negative numbers, discussion of Greek variables and basic skills drills (most often single-digit multiplication).

### SEED Specialist Techniques

The guided discovery method encourages whole group and individual student responses through verbal participation and nonverbal hand signals. Participation is regulated by techniques which SEED specialists use during their instruction. Table 3 displays SEED Interaction Techniques.

Table 3

SEED Interaction Techniques

| FEEDBACK/INVOLVEMENT | BUILD CONFIDENCE/ SUCCESS REINFORCEMENT | FOCUS FOR FEEDBACK INVOLVEMENT/CONTENT REINFORCEMENT |
|---|---|---|
| Hand signals for agreement/disagreement/ support | Students call on other students | Involve teacher |
| Finger signals | Student to the board | Stop eraser/chalk |
| Hand count | Star problems | Rapid questions/drill |
| Chorus (unison) responses, reading | | |
| Repeated responses | | |
| Deliberate errors | | |

Specialists use SEED techniques to produce observable student responses to questions. Table 4 displays a rank-order summary of the techniques which were observed during classroom visitations and reflects the frequency of students' responses (either verbally or by hand and/or finger signals) which were observed.

Table 4

Rank Order Summary of Project SEED Techniques Observed during 15 Classroom Visitations

| SEED Technique | Frequency of Observation | Number of Classes in which Technique was Observed |
|---|---|---|
| Chorus Responses | 153 (47%) | 15 |
| Hand Signals for Agreement/ Disagreement | 77 (24%) | 14 |
| Finger Signals | 38 (12%) | 13 |
| Student Calls on Other Student | 15 (5%) | 9 |
| Student to Board | 15 (5%) | 9 |
| Hand Count | 13 (4%) | 7 |
| Stop Eraser/Chalk | 9 (3%) | 5 |
| Deliberate Error | 4 (1%) | 1 |
| Star Problems | 2 (.6%) | 2 |
| Repeated Responses | 1 (.3%) | 1 |
| Involved Classroom Teacher | 1 (.3%) | 1 |
| Total | 327 | |

The most frequently-observed technique was enouraged chorused responses, which occurred during every class visitation. Chorused responses and hand and finger signals were used by all the specialists, including the corporate volunteers. It is likely that the other techniques were used by all the specialists, but were not observed during the period of classroom visitation.

Individual Student Responses

In addition to group responses, students had many opportunities to participate individually during SEED classes. Fifty-four percent of the students (n=164) responded once or twice during classroom observations, 23% (n=71) responded

three or more times, and 23% (n=69) did not respond at all. The response frequencies were similar across classes and specialists with one exception. One specialist's classes were characterized by larger numbers of non-respondents and fewer numbers of responses in general. There were no differences among frequency of student responses in classes where teachers participated and where they merely observed.

Table 5 rank-orders the categories of individual student responses which were coded during classroom observations.

Table 5

Rank-Order Summary of SEED Student Response Categories

| Response Category | Frequency |
|---|---|
| Rote Drill/Recall | 249 (40%) |
| Explanations | 89 (15%) |
| Guess an Answer | 79 (13%) |
| Repeat Answers | 61 (10%) |
| Read Answers | 40 ( 7%) |
| Original Questions/Comments | 40 ( 7%) |
| Recall/Recite Rule | 24 ( 4%) |
| Give a Number to Start a Problem | 12 ( 2%) |
| General Information | 6 ( 1%) |
| Call on Other Student | 4 ( 6%) |

While the majority of individual responses were rote drill or recall, it is important to note that students' explanations, original questions and comments accounted for nearly a quarter of the responses recorded. The evaluator interpreted the original questions, comments, and explanations as displays of the students' higher-level thinking. These student responses typically extended the classroom conversation in new ways, or allowed students opportunities to articulate the process they used to solve a problem or to explain their understanding of a topic.

Summary tables of specialist techniques, frequency of student responses and response content categories are in Appendix C.

## MATHEMATICS ACHIEVEMENT

Achievement growth was measured by the Portland Achievement Levels Test (PALT) in mathematics, administered both fall and spring to all District fourth and fifth grade students, including those participating in Project SEED. Only clear and intact group scores were used; that is, only if a fourth or fifth grade SEED student had both a Fall and Spring mathematics score in the same school would the score be included for comparative data analysis. Mean achievement gains of the SEED group were compared with mean achievement gains of fourth and fifth graders District-wide and with fourth and fifth grade non-SEED students in Project schools.

The results are reported for each implementation year in tables using Fall and Spring RIT means and RIT gains, deviation scores, and standardized residuals. These statistics are defined as follows:

1. RIT scores are equal interval curriculum-based scores obtained from the PALT. They show a level of basic skills achievement on a scale from 140-270.
2. The RIT gain is the amount of difference between the fall and spring RIT means.
3. Deviations are group statistics showing the deviation of a group mean from a mean of all group RIT means in the District.
4. Standardized residuals are standard scores determined from the relationship between the amount of gain made between fall and spring and the fall achievement level. Based on this relationship, a gain for a group of students is predicted from their fall achievement levels, and the predicted gain is compared with the actual gain. The difference between the actual and predicted gains is called the "residual." A positive standardized residual indicates that the group's actual gain was greater than their predicted gain, and larger than the gain of other groups with the same fall achievement level. A negative standardized residual indicates that the group gained less than was predicted, and less than other groups who began the year at the same achievement level.

Table 6 displays 1986-87 Fall and Spring grade level group means, average group gains, group deviations from District grade level means, and standardized residuals.

Table 6

1986-87 Math RIT Means, Gains, Deviations and Standardized Residuals for SEED Students

| Grade | Fall 86 RIT Mean | Spring 87 RIT Mean | 1986-87 RIT Gain | Fall 86 Deviation | Spr 87 Deviation | Standardized Residual | N |
|---|---|---|---|---|---|---|---|
| 4 | 191.1 | 198.6 | 7.5 | -1.71 | -1.68 | -.12 | 166 |
| 5 | 200.9 | 207.5 | 6.7 | -1.67 | -1.42 | .64 | 141 |

Fourth grade SEED students gained an average of 7.5 RIT points Fall to Spring and fifth graders gained 6.7. Both groups' deviation scores indicate that the students are below the District grade-level average. The standardized residuals indicate that the fourth graders' gained about the same as District students who began the year at comparable RIT levels. The SEED fifth graders' gain was greater than that of students at comparable fall RIT levels.

SEED students' math achievement data were disaggregated and compared with that of non-SEED students in comparable grades in the project schools. It is important to remember that all the fourth and fifth graders had a regular math program and some participated in SEED and/or Chapter 1 math as well. Table 7 displays achievement data by school program membership.

Table 7

1986-87 Math RIT Means, Gains, Deviations and Standardized Residuals by Math Program Membership

| | Grade | Fall 86 RIT Mean | Spring 87 RIT Mean | 1986-87 RIT Gain | Fall 86 Deviation | Spr 87 Deviation | Standardized Residual | N |
|---|---|---|---|---|---|---|---|---|
| SEED Only | 4 | 196.7 | 203.3 | 6.6 | -.54 | -.84 | -1.14 | 97 |
| Chapter 1 Math Only | 4 | 184.8 | 192.3 | 7.5 | -3.03 | -2.78 | .42 | 44 |
| SEED & Chapter 1 Math | 4 | 183.2 | 191.9 | 8.7 | -3.36 | -2.86 | 1.33 | 69 |
| Non-SEED & Non-Chapter 1 Math | 4 | 200.8 | 207.9 | 7.1 | .33 | -.02 | -1.18 | 112 |
| Total | 4 | 193.6 | 200.9 | 7.3 | -1.18 | -1.25 | -.42 | 322 |
| SEED Only | 5 | 206.0 | 212.9 | 6.9 | -.46 | -.47 | -.10 | 86 |
| Chapter 1 Math Only | 5 | 196.6 | 205.2 | 8.6 | -2.69 | -1.83 | 2.59 | 16 |
| SEED & Chapter 1 Math | 5 | 192.8 | 199.1 | 6.3 | -3.58 | -2.92 | 1.80 | 55 |
| Non-SEED & Non-Chapter 1 Math | 5 | 210.3 | 217.7 | 7.4 | .54 | .37 | -.52 | 95 |
| Total | 5 | 204.1 | 211.2 | 7.1 | -.90 | -.77 | .33 | 252 |

These data indicate that students who did not participate in Project SEED had a higher average RIT gain from fall to spring than SEED-only students, and the standardized residuals indicate that the gain for SEED students is largely due to gains made by students who also had Chapter 1. The performance of students who only had SEED and their regular program was comparable to that of students who had the regular program without SEED -- neither group gained as much as other District groups who started the year at comparble RIT levels and neither group gained as much as students who participated in Chapter 1 with or without SEED.

These data suggest that participation in Project SEED has not resulted in important achievement gains, even though the time for math instruction has doubled.

Table 8 displays 1987-88 fall and spring grade level group means, average group gain, group deviations from District grade level means, and standardized residuals.

Table 8

1987-88 Math RIT Means, Gains, Deviations and Standardized Residuals for SEED Students

| Grade | Fall 87 RIT Mean | Spring 88 RIT Mean | 1987-88 RIT Gain | Fall 87 Deviation | Spr 88 Deviation | Standardized Residual | N |
|---|---|---|---|---|---|---|---|
| 4 | 191.8 | 203.1 | 11.3 | -1.56 | -1.05 | 1.26 | 106 |
| 5 | 202.9 | 209.7 | 6.7 | -.98 | -1.02 | -.30 | 214 |

Fourth grade SEED students gained an average of 11.3 RIT points Fall to Spring and fifth graders gained 6.7. Both groups' deviation scores indicate that the students are below the District grade-level average. The standardized residuals indicate that the fourth graders gained more than District students who began the year at comparable RIT levels. The SEED fifth graders' gain was about the same as District students who began the year at comparable RIT levels.

When SEED students' math achievement data were disaggregated and compared with that of non-SEED students in comparable grades in the project schools, the achievement trend of the previous year was repeated. Table 9 displays achievement data by school program membership.

Table 9

1987-88 Math RIT Means, Gains, Deviations and Standardized Residuals by Math Program Membership

| | Grade | Fall 87 RIT Mean | Spring 88 RIT Mean | 1987-88 RIT Gain | Fall 87 Deviation | Spr 88 Deviation | Standardized Residual | N |
|---|---|---|---|---|---|---|---|---|
| SEED Only | 4 | 200.8 | 210.1 | 9.4 | .35 | .36 | .06 | 35 |
| Chapter 1 Math Only | 4 | 184.7 | 194.7 | 9.9 | -3.09 | -2.79 | .40 | 36 |
| SEED & Chapter 1 Math | 4 | 187.1 | 199.5 | 12.4 | -2.58 | -1.82 | 1.89 | 70 |
| Non-SEED & Non-Chapter 1 Math | 4 | 197.1 | 207.0 | 9.8 | -.43 | -.29 | .35 | 26 |
| Total | 4 | 191.0 | 201.8 | 10.8 | -1.74 | -1.33 | .95 | 167 |
| SEED Only | 5 | 207.0 | 214.6 | 7.6 | -.14 | -.17 | -.14 | 115 |
| Chapter 1 Math Only | 5 | 196.2 | 204.5 | 8.3 | -2.38 | -1.95 | 1.24 | 62 |
| SEED & Chapter 1 Math | 5 | 198.2 | 204.0 | 5.8 | -1.97 | -2.03 | -.50 | 99 |
| Non-SEED & Non-Chapter 1 Math | 5 | 209.3 | 216.5 | 7.3 | .33 | .16 | -.56 | 157 |
| Total | 5 | 204.3 | 211.4 | 7.2 | -.71 | -.73 | -.18 | 433 |

The average RIT gain for fourth and fifth graders who did not participate in Project SEED was comparable to the gain made by SEED-only groups. The standardized residuals indicate that the performance of students who had SEED only (and their regular program) was comparable to that of students who had the regular program without SEED -- both groups gained as much as other District students who began the year at similar RIT levels. Doubling the time for math instruction with SEED has not resulted in important achievement gains. In 1987-88, comparisons of achievement growth were made between fifth

graders with one and two years of Project SEED participation (105 fifth graders participated as fourth graders during 1986-87). There were no differences in growth for students receiving instruction in SEED for one or two years. Graphic representations of achievement data for both 1986-87 and 1987-88 are in Appendix B.

## STUDENTS' ATTITUDES TOWARD MATHEMATICS

During the first evaluation of Project SEED in the Portland Public Schools, the "Portland Public Schools Math Questionnaire" was administered to SEED students and no differences were found between the pre and post-tests. Because Project expectations have altered to emphasize goals for improved attitudes, the evaluator conducted a literature search for more suitable measures and the "Attitude Toward Mathematics" was chosen for the 1986-87 evaluation. The "Attitude Toward Mathematics" survey was developed by the National Assessment of Eductional Progress (NAEP) and has national results for nine-year olds, a school-aged group typically enrolled in grade four. It has been used in other evaluations of Project SEED. In 1987-88, a representative sample of SEED students were interviewed about their perceptions of the SEED experience. Both the attitude survey, and the student interviews were conducted in the spring at the end of the school year.

### 1986-87 "Attitude Toward Mathematics" Survey

The "Attitude Toward Mathematics" survey was administered to SEED and non-SEED students in the Project schools and in neighboring schools which did not participate in the program. The survey was administered to 1,023 fourth and fifth graders in schools in the Jefferson and Grant Clusters in spring, 1987. The evaluator administered the surveys in regular classroom settings in Project SEED and other cluster schools which do not offer SEED classes. Five hundred seventy-six fourth graders completed the survey (145 or 25% were in SEED) and 447 fifth graders completed the survey (132 or 30% were in SEED).

The proportions of fourth graders, both SEED and non-SEED, responding positively to the seven-item survey were compared with the national results for nine year olds. There are no national results for fifth grade students, but their responses are included for descriptive information. Students were asked to respond to seven items by circling one of three responses -- "True About Me" (T), "Sometimes True About Me" (S), and "Not About Me" (N).

Table 10 presents the percentage of student responses to each of the seven survey items. The first column of responses are from SEED fourth graders, the second column are non-SEED fourth graders, and the third column displays the national age-nine norms.

Table 10

Percent of Fourth-Grade Student Responses to "Attitude Toward Mathematics" Survey

| Survey Item | SEED N=145 (T | S | N) | NON-SEED N=431 (T | S | N) | NATIONAL AGE 9 (T | S | N) |
|---|---|---|---|---|---|---|---|---|---|
| 1. I am good at working with numbers | 67 | 31 | 2 | 61 | 38 | 1 | 55 | 40 | 5 |
| 2. I usually understand what we are talking about in mathematics | 37 | 57 | 6 | 42 | 56 | 2 | 39 | 57 | 4 |
| 3. I feel good when I solve a hard mathematics problems by myself | 79 | 16 | 5 | 85 | 12 | 3 | 75 | 20 | 5 |
| 4. Mathematics is fun for me | 45 | 46 | 9 | 47 | 43 | 10 | 45 | 46 | 9 |
| 5. Mathematics is boring for me | 8 | 41 | 51 | 10 | 32 | 58 | 17 | 31 | 52 |
| 6. Doing mathematics makes me nervous | 19 | 35 | 45 | 18 | 38 | 44 | 21 | 30 | 49 |
| 7. Working with numbers upsets me | 8 | 26 | 67 | 6 | 17 | 76 | 12 | 32 | 56 |

Portland students' responses (both SEED and non-SEED students) tended to be more positive than those of the age-nine norming group. Non-SEED students were more positive than SEED students on five of the seven survey items #2, 3, 4, 6, 7 and SEED students were more positive on items 1 and 5. On 13 of 21 comparisons across the three response categories for each item, non-SEED students were more positive. SEED students were more positive eight of 21 times.

Table 11 displays the fifth-graders' responses. SEED fifth graders tended to be more positive than non-SEED fifth-graders on items 1, 2, 6, 7 and there was a tie on item 4. Of 21 comparisons across the three response categories for each item, SEED students were more positive 14 times, non-SEED students were more positive four times and there were three ties.

Table 11

Percent of Fifth-Grade Student Responses to "Attitude Toward Mathematics" Survey

| Survey Item | SEED N=145 (T | S | N) | NON-SEED N=431 (T | S | N) |
|---|---|---|---|---|---|---|
| 1. I am good at working with numbers | 62 | 36 | 2 | 51 | 46 | 4 |
| 2. I usually understand what we are talking about in mathematics | 46 | 51 | 4 | 44 | 51 | 5 |
| 3. I feel good when I solve a hard mathe-mathics problems by myself | 81 | 15 | 5 | 82 | 15 | 3 |
| 4. Mathematics is fun for me | 42 | 45 | 13 | 42 | 44 | 15 |
| 5. Mathematics is boring for me | 12 | 35 | 53 | 10 | 41 | 49 |
| 6. Doing mathematics makes me nervous | 11 | 37 | 52 | 12 | 40 | 48 |
| 7. Working with numbers upsets me | 3 | 14 | 83 | 4 | 26 | 70 |

1987-88 Student Interviews

An interview questionnaire was designed to collect information on students' perceptions of their SEED experiences. The four interview questions were intended to give students an opportunity to describe what kinds of things they learned in Project SEED, to explain how SEED fit with their regular math learning experiences, and to tell how much they liked participating in the program.

Eighty-nine fourth and fifth graders were interviewed in the spring of 1988. Respondents were equally distributed among boys and girls, 60 respondents were in grade five and 29 were fourth graders. Students were randomly selected from 15 classes for the five to ten-minute interviews. Approximately five students from each class participated. Students from three classes were unable to participate because of scheduling conflicts.

The evaluator read the four interview questions to each student and recorded verbatim responses. The evaluator routinely encouraged the students to "tell me more about that" to clarify and/or extend individual responses. Students who volunteered to share their SEED notebooks or who wished to write out samples to help answer questions were encouraged to do so. Table 12 displays a topical summary of student responses, and the table is followed by samples of SEED students' answers to the interview questions.

Table 12

Summary of Student Responses to Interview Questions (N=89)

| QUESTION | RESPONSE | FREQUENCY |
|---|---|---|
| Tell me about your math classes this year. What kinds of things are you studying in math? | Fractions | 48 |
| | Addition, Subtraction, Multiplication, Division | 48 |
| | Decimals | 10 |
| | Geometry | 10 |
| | Measurement | 2 |
| Are you learning about math in any other classes besides the one taught by your regular teacher? | Yes | 54 |
| | No | 33 |
| | I don't know | 2 |
| What kinds of things are you learning about in Project SEED? | E or Exponentiation | 48 |
| | Alpha, beta, Greek alphabets | 16 |
| | Log problems | 4 |
| | Summation | 4 |
| | Additive law for exponents ALFE | 3 |
| | Negative numbers | 2 |
| | Reference to techniques, e.g., hand signals, star problems, etc. | 11 |
| How does what you do in Project SEED fit with the other things you're learning about math? | It doesn't | 30 |
| | They both have fractions | 27 |
| | They both have addition, subtraction times, and division | 11 |
| | It's the same as other math | 4 |
| | It's like regular but uses words of algebra | 3 |
| | SEED helps you figure out other math | 1 |
| | I don't know | 12 |
| How do you like Project SEED? | I like it | 48 |
| | It's Okay | 20 |
| | It's boring, repetitious | 16 |
| | No | 3 |
| | I don't know | 2 |
| Would you like to be in the Project SEED next year? | Yes | 63 |
| | Maybe | 9 |
| | No | 14 |
| | I don't know | 3 |

**Tell me about your math classes this year. What kinds of things are you studying in math?**

Students responded to this question by naming the mathematics typics they were currently studying (fractions) and the topics they had studied earlier in the year (addition, subtraction, multiplication, division). For example:

> "Fractions and 'plusses' and multiplication and division." (Student grade 4)
>
> "Fractions so far, and we learned to add and subtract and to change improper fractions to mixed numbers and to multiply and to change mixed numbers into improper fractions. 22 divided by 4 is five and two-fourths, which is five and one-half and that's a mixed number." (Student grade 4)
>
> "Multiplication, fractions and geometry. We do stuff with our teacher. Our teacher will put a problem on the board like multiplication, division numbers like one and one-half times two and two-thirds, and she lets us work in our math book at our own level and at our own pace. I'm in Chapter 5 geometry." (Student grade 5)
>
> "Mostly fractions, division, big 'times' problems like thousands. We cut out fractions to see how much they add together." (Student grade 5)

When asked if they had any other math class besides that taught by their regular classroom teacher, 54 students named Project SEED. Thirty-three students said they didn't have any other math classes, but when reminded of Project SEED, they agreed that it was a mathematics class. Two students did not answer the question.

**Tell me about Project SEED. What kinds of things are you learning about in Project SEED?**

Students most often described their math learning in SEED in terms of exponentiation. The majority of the students said that exponentiation meant "times" or multiplication. Seventeen students said they couldn't remember exactly what exponentiation meant and nine students were able to give specific examples of SEED exponentiation activities.

> "Algebra. It's not really math. We learned 'timsing' the letters and I think that's all. We put like 2E3 or something; we just write it down and you times it." (Student grade 5)

"Exponents. I'm not sure what it means. Base is like 5, then E, then another number and the other number is an exponent, 5E2=10 because 5 times 2 is ten. E means exponentiation." (Student grade 4)

"Well, we learn algebra before we get in our higher grades. 2E5=32. Because 5 tells us how many times to write the 2--2x2x2x2x2 = 32. E means exponentiation." (Student grade 5)

"We learn like more 'times' things and we learn new algebra words like exponents and things like that. I forgot what it is. We write 2E1 or the words like rewriting new words. 2E1 is an opposite way of doing times tables. 2E1 is 1. That was the hardest problem; we stayed on that for days." (Student grade 5)

"We learn algebra. It's an E formation, like 2E3. It's an algebra problem. I'll get my book (reading from her list:) 2E1 is 1/2. We do quantity problems like this (writing) (2E3) x (2E4) = 2E7. It's sort of like 'plusses.' You plus the three and the four and leave the base the same." (Student grade 5)

After exponentiation, students most often mentioned alpha, beta and other Greek alphabet variables, e.g., "We use signs like alpha and beta. They are algebra signs that stand for any number" (Student grade 5). Students also referred to the SEED interaction techniques when describing the program. For example:

"Like alpha times beta equals so and so. They stand for any number. We're learning things for college kids but we're learning all kinds of things. We play algebra games, fractions, he gives us five and one over three and whoever gets it quickest they win because it's sixteen thirds." (Student grade 4)

"Signs like this (showed hand signals). This means you agree and this means you don't agree (acted out hand signals). We did some things with squares in it. We wrote down everything like quantities. I forgot what it is." (Student grade 4)

"Algebra's a different subject. We take down different words like base, exponents, equivalents and lots of different words. Sometimes he gives us a problem, walks around the room and checks it. He always asks people to come up to the board and do a problem." (Student grade 5)

"Variables, it's a substitution for a number. We start off with a warm-up. He calls up a kid to go and warmup the class on like 2 x 1, 8 x 2 and also on negative numbers." (Student grade 5)

How does what you do in Project SEED fit with the other things you're learning about math?

Thirty students described SEED as a different and separate kind of math from that taught in the regular program. Comments on the fit between the two programs included the following:

> "It doesn't. In our textbook we start at addition, go up to times and division. In algebra it's like doing it all together. It gets confusing." (Student grade 5)
>
> "It didn't fit in. It was way different than what we were learning." (Student grade 5)
>
> "Fitted in hard. Sometimes we were supposed to do times and I'd do 2E2 and then when we had SEED I'd do two times two." (Student grade 5)

Twenty-seven students remarked that both SEED and the regular program included fractions and 19 students commented on other similarities, e.g., that both SEED and the regular program emphasized addition, subtraction, multiplication, and division.

> "Normally he (SEED specialist) teaches some of the things our teacher does." (Student grade 5)
>
> "Like we're doing decimals (now). When he asked what do we want to work on, kids asked about doing fractions in the regular class and he did. we're working decimals and now we do it in algebra." (Student grade 4)
>
> "Sometimes it goes together. We're working on fractions in both but we don't do algebra math in regular math." (Student grade 5)

How do you like SEED? Would you like to be in Project SEED next year?

Forty-eight students said they liked SEED and 20 students said the program was "okay." The most common reason given for liking the program was that it was "fun."

> "It's fun. One reason is that it teaches me more and helps me learn my fractions more than I was. It wouldn't hurt (to be in SEED again.)" (Student grade 5)

"Yes. A lot of fun because we get to change name tags and the kids get to be the teacher and we play games." (Student grade 5)

"I like it a lot because it's one of my best subjects and I get my best grades in math. We're learning stuff kids learn in high school and college and it's pretty fun." (Student grade 5)

Sixteen respondents said SEED was boring and repetitious "because he teaches us mostly the same thing over and over again. Yes, it could be better with different math and new stuff" (Student grade 5). Three students said they disliked being in the program. Of the 86 students who responded, 63 would like to be in the program again, nine said "maybe" and 14 said "no."

## FOLLOW-UP: PARTICIPATION IN MIDDLE SCHOOL MATH CLASSES AND PROGRAMS

During 1987-88, approximately 420 SEED "graduates" were of middle school age and a review of middle school math program enrollment was conducted to determine the extent of those students' participation in advance math classes. Five advanced math classes are offered to qualified middle school students in grades six through eight: Transition Mathematics, Enriched Mathematics, Algebra, Pre-Algebra, and Geometry. The MESA Program (Mathematics, Engineering, Science Achievement) actively recruits interested middle school students to its extra-curricular program activities. MESA's enrollment records were reviewed to identify SEED graduates. Table 13 displays the number of SEED and non-SEED seventh graders enrolled in advanced math classes during 1987-88, and the number of SEED and non-SEED students who participated in MESA during 1987-88.

Table 13
Frequency of Sixth/Seventh Grade Student Enrollment in
Advanced Math Programs, 1987-88

| Math Program | Student Enrollment | | Total |
|---|---|---|---|
| | SEED | Non-SEED | |
| Transition Math | 5 | 63 | 68 |
| Enriched Math | 5 | 84 | 89 |
| Algebra | -- | 32 | 32 |
| Pre-Algebra | -- | 18 | 18 |
| Geometry | -- | 1 | 1 |
| Total | 10 | 198 | 208 |
| MESA | 10 | 195 | 205 |
| Total | 10 | 195 | 205 |

One SEED student was counted twice because she is in both MESA and Enriched Math. The number of duplications among non-SEED students was not calculated.

Approximately 2% of the SEED graduates are enrolled in advanced math classes and 2% are in MESA. Approximately 7% of the non-SEED students are enrolled in advanced math classes, and 3% of non-SEED students are in MESA. It is important to note that some students (both SEED and non-SEED) may be unable to participate in MESA because the program is not yet implemented in all the District's middle schools.

## FINDINGS

SEED was implemented according to Project requirements in both 1986-87 and 1987-88. Specialists phased in the implementation, taught 45-minute classes four days a week to heterogeneous student groups. Though individual SEED classes varied in duration from five to 24 weeks in length, there were more semester/year-long classes conducted during 1987-88. SEED maintained a year-long presence in the project schools.

Half the teachers who participated were volunteers, and half were assigned to the program by their principals. Teachers gave up a fourth of their whole-group instructional time to have their class participate in SEED and they took the time from language arts, the regular math program and science. Both teachers and principals continued to report concerns about the lack of integration between the SEED curriculum and that of the regular math program, though they reported that specialists included more fractions instruction during the past two years.

Observations documented a consistent use of SEED techniques by both specialists and corporate volunteers. During classroom observations, the curriculum most often consisted of exponentiation and fractions. Students participated extensively (both as a group and individually) during SEED classes. While the majority of their participation was in a responsive drill and practice mode, nearly a quarter of the individual student responses coded during observations included original questions, comments and explanations which were interpreted as evidence of students' higher-level thinking.

Seven corporate volunteers were trained by the project during the past two years. Each volunteer has taught for a short period of time but none has met the goals of teaching a class for a semester. None of the volunteers has repeated his or her participation in the program.

While students were in SEED, their instructional time for math was doubled, but their achievement has not been notable. SEED students have typically made gains comparable to those of non-SEED students in the District and in the project schools. Students with SEED as their only supplementary math program have consistently gained less than low-achieving students in the project schools who participate in Chapter 1 math programs.

Student responses to the 1986-87 Attitude Toward Math survey were mixed. All of the Portland Public School fourth graders who were surveyed (both SEED and non-SEED) responded more positively on the survey than the age-nine norming group. Responses of the non-SEED fourth graders were typically more positive than responses of the SEED students. SEED fifth-graders responded more

positively than non-SEED students. A summary of responses to the 1987-88 Student Interview Questionnaire indicated that fourth and fifth graders enjoyed the SEED learning experience. Students typically explained that SEED differed from the regular math program because it emphasized exponentiation. Students were unable to explain much about exponentiation other than that "E means times." A third of the respondents reported that both regular and SEED classes emphasized fractions.

Follow-up studies of SEED graduates indicates that when SEED and non-SEED students are compared, a smaller proportion of SEED students are in middle school advanced math classes and/or in the District's MESA program.

## CONCLUSIONS AND RECOMMENDATIONS

The District implemented Project SEED to enhance students' self-esteem for math learning and to increase achievement in mathematics. The program has been implemented according to project requirements. It is important to note that the SEED curriculum is largely independent of the regular math curriculum. Administrators and teachers have repeatedly expressed concern with the lack of integration between SEED and the regular math program. A representative sample of SEED students who were interviewed were typically unable to communicate either an understanding of exponentiation (the program's chief curriculum topic) or to explain other relationships between their regular learning experiences and Project SEED. According to interviewed students, SEED is an enjoyable classroom experience. It might be considered as educationally enriching.

This evaluation report documents for a third year that doubled instructional time in math with Project SEED produces neither appreciable gains in positive attitudes about math, nor important growth in mathematics achievement, nor increased enrollment in advanced math classes at the middle school level,

These data warrant neither an expansion nor a continuation of the program in the Portland Public Schools. It is recommended that Project SEED be discontinued.

APPENDIX A

- Principal Interview Questionnaire and Summary of Responses
- Interview Questionnaire for Teachers of "Long-Term" SEHD Classes and Summary of Responses

1986-87 and 1987-88 Project SEED Evaluation

PRINCIPAL INTERVIEW QUESTIONNAIRE

1. What purpose does Project SEED fulfill in your school program goals?

2. Which class/es will participate in Project SEED? How were they chosen?

3. Are participating classes heterogeneously or homogeneously grouped for Project SEED instruction? Does the regular classroom teacher provide math instruction to the same group of students?

4. How much time will be spent in Project SEED instruction? (i.e., minutes/day; days/week; weeks/year)

5. How much time will be spent in regular math instruction? (i.e., minutes/day; days/week; weeks/year)

6. How much time will be spent in Chapter 1 math instruction? (i.e., minutes/day; days/week; weeks/year)

7. How is instructional time reallocated to allow time for Project SEED? (i.e., What is being given up? Reading, language arts, social studies, science, other time?)

8. What outcomes do you expect as a result of participation in Project SEED?

9. How does Project SEED interface with the regular and/or other supplementary math curriculum and instruction?

10. What adjustments has SEED made to make the program better serve the needs of staff and students in your school?

Summary of Principal Responses
1986-87 Project SEED Evaluation

Principal Interview Questionnaire

1. What purpose does Project SEED fulfill in your school program goals?

I see it as a possible change agent helping all staff to take a look at a different way of instruction. We do have a goal to try to lift certain grade levels to or above District average in math.

Community relations; positive student self-image; improved teaching strategies; higher-level thinking skills.

Self-esteem; classroom management techniques very positive; all class involvement; children responding; instructional strategy - some esteem related to Algebra - instills some math values. Use of nonverbal signals by students.

Teaches kids thinking skills, self-esteem, logic and some math skills.

Doesn't fit into any specific goals or objectives of this school. Does offer something to make kids happy learning - look at learning with a different light.

It doesn't fulfill anything in my school goals. I like what SEED gives in terms of feeling and active participation but don't see academic consequences and it's out of sequence.

I think it gives children awareness of a different method of math; it opens up a method for children to do new things.

It does not; is not consistent with our goals. We are looking at scope and sequence in each area to teach those things that are appropriate in those grade level areas. SEED goals were not directly related. I have had even less contact with the program this year than last. I think there are some kids who like it, really enjoy it, and it adds a dimension to their math instruction.

2. Which class/es will participate in Project SEED? How were they chosen?

We decided to follow the kids through the grades. The current teacher will be in the program all year. They may try to add another class later so that all kids will have a second year. I am glad the program is here.

One 5th now; trying for other 5th - SEED doesn't have enough staff yet. Our 2 teachers asked to participate; they were in orientation last year.

2. Which class/es will participate in Project SEED? How were they chosen? (continued)

The teacher was asked to participate; how long he will participate is a question. He has no 45-minute period with his class. If SEED would do 30 minutes, we could work it in more.

One 4th grade class only; we were told we could have only one specialist; I chose class I thought housed best support for kids and teachers. Teachers selected did orientation last year.

4/5; she volunteered; none others volunteered. She had orientation last year.

A fifth grade teacher was mandated by the principal to do it.

Everybody in grades 4, 5 volunteered. All will be in the program all year.

4th, chosen because she was only 4/5 teacher with orientation and she was willing. She liked program and people in it.

3. Are participating classes heterogeneously or homogeneously grouped for Project SEED instruction? Does the regular classroom teacher provide math instruction to the same group of students?

Heterogeneously grouped for SEED; regular math is taught homogeneously in 4th; high 5th; and average.

Heterogeneously for SEED; not for regular -- students are split between 3 teachers for regular math instruction.

Yes -- Yes

They are heterogeneously grouped for both SEED and regular math instruction.

Yes -- for our school they are not severely below grade level learners, but some are students with severe behavior problems - selected because they have potential to be at grade level.

Heterogeneously - the regular classroom teacher provides math instruction until next grading period; then next 9 weeks someone else will teach that group.

All are heterogeneously grouped. Regular instruction is grouped, but only the 2 teachers (one in SEED now; the other likely to be replacement after X-mas) involved in the regular instruction. Two 5th grade orientation classes were held in Project SEED this spring.

Heterogeneously, same group for both.

4. How much time will be spent in Project SEED instruction? (i.e., minutes/day; days/week; weeks/year)

   30-40" day/4 days a week - once they get going.

   45"/day; 4 days/week all year; if we don't get another specialist, it will end in January at semester. The SEED specialist will then work with another teacher for the second part of the year.

   45"/day; 4/days a week at least through January 6. The teacher will see how it goes from there. Another 4th grade teacher took the orientation and did it the rest of the year. The former teacher felt other subjects lost too much at 45" per day, 4 days per week.

   45"/day.

   45"/week; might start October, November, December . . .

   30"/day; 4 times/week.

   35-40"/day; 4 days a week.

   40 minutes/day, 4 days/week, sustained for full year.

5. How much time will be spent in regular math instruction? (i.e., minutes/day; days/week; week/year)

   5th: 50"/day
   4th: 45"/day

   40-45"/day; 4 days/week

   At least 45-60"/day all year.

   30-45"/day; PSM 10" additional for regular math.

   55"/day

   55"; daily

   35-40"/day

   At least 50 minutes/day.

6. How much time will be spent in Chapter 1 math instruction? (i.e., minutes/day; days/week; weeks/year)

   15"/day Prescription Learning all year; one or two may leave during SEED.

   40/45"; 3-4 days a week is designed for Chapter 1 support.

6. How much time will be spent in Chapter 1 math instruction? (i.e., minutes/day; days/week; weeks/year) (continued)

CCC drill and practice 10" during another time of day; aides support math instruction in regular classroom also for 45-60" per day.

Different from student to student, depending on individual needs.

No Chapter 1 math students in class.

30"/day, 4 days/week; some may leave for Chapter 1 during regular math.

Prescription Learning math is not during regular math or SEED; about 30"/day for 5 week periods.

Probably a few kids (maybe a couple of kids) are in Chapter 1 math pullout at 30 minutes/day, 4 days/week.

7. How is instruction time re-allocated to allow time for Project SEED? (i.e., What is being given up? Reading, language arts, social studies, science, other time?)

It's going to cut into social studies.

Teachers will be able to tell you that.

Teacher will be able to tell you that. She said social studies, health, science and language usage were those she gave up.

Some science, social studies, health.

Planning periods, (not out of music, P.E.). Language Arts, (including reading) math, are not touched.

Individual teacher will have to decide.

Taking a little time out of Language Arts and reading.

We have so much fragmentation to begin with, we've been trying to decrease (to have fewer people with kids and a more integrated curriculum so everything fits). I have been insistent that other programs not be in the school and that we have control. SEED may have merit in many contexts, but this is not necessarily the one.

8. What outcomes do you expect as a result of participation in Project SEED?

Given an outstanding instructor, I believe the kids are in a position to make above average gains in achievement - the teachers would be more versed in method and use it.

8. What outcomes do you expect as a result of participation in Project SEED? (continued)

Higher self-esteem; greater ability to grasp concepts quicker; improved thinking skills; classroom behavior; willingness to be supportive of others. Achievement and learning from mistakes; improvement in math skills.

Because of self-esteem we could see some increase in achievement. They really appear to be having fun. Two ESL children may not be enjoying it - students with serious behavior problems are able to be engrossed during the SEED specialist instruction. I see mature problem solving happening in and out of class.

Teaches kids thinking skills, self-esteem, logic and some math skills.

If specialists come and teach on a regular consistent basis, students might have better feeling about their math learning.

The low SES students would probably have better self-image. It's a processes, not a product we get. They prove to themselves that they can answer as well as anyone else in the room.

I expect the kids will be more interested in math, in different process, more eager to learn, and I expect an increase in self-esteem for math.

I had no expectations.

9. How does Project SEED interface with the regular and/or other supplementary math curriculum and instruction?

PSM will come very close and there's a certain logic to both SEED and PSM and they can't help apply it to SEED math - can't help but have an effect on the Heath program.

It complements the regular curriculum but doesn't directly supplement it; SEED and regular math complement one another, but no more directly than literature complements the regular reading basal.

Skills in SEED are important in any area; not just math. It may create and sustain high interest, catch a lot of kids and keep them with math.

SEED doesn't interface with the regular math curriculum.

At this time the effectiveness of the SEED program is dependent on the abilities of the SEED instructor.

Not at all - no correlation between programs or goals, their ability in school; may provide fleeting knowledge of (introduction to) concepts; not concrete.

9. How does Project SEED interface with the regular and/or other supplementary math curriculum and instruction? (continued)

May have to split the interface of attitude and curriculum; there is not a curriculum interface at this point and teachers don't see one. We rather expected SEED to use Heath text in Socratic method.

I think it does not, but it reinforces some of the things; the SEED curriculum is over and above. They do have time to talk to SEED either daily or weekly.

I don't see a great interface. It perhaps fits in with problem-solving to help kids use those processes.

10. What adjustments has SEED made to make the program better serve the needs of staff and students in your school?

None as yet.

The specialist sat down to meet with the teacher and principal regarding student problems. They come to staff events and participate in faculty events and programs. None.

Our most seriously disturbed child is able to participate in SEED in a positive way. Not in terms of time; they are accommodating in general.

SEED doesn't supplement the district math program. The issue of classroom teachers learning the strategies isn't directly faced. We were told we couldn't make a larger SEED class based on kids' needs for the program. They wanted fifth graders and some of ours have already had SEED. I didn't want the program in the same room all year because of our bad experience last year, so it is split between two rooms. The program will go to a fourth-grade class during the second half of the year. What is the value if one class per school is in SEED? Let's choose kids who will do well, and we should keep the program in one grade level. Some of the kids are really bored. The SEED teacher requires everyone to have the right response before he goes on. I cannot get any continuum from these folks. The folks are pleasant; the program is a time-waster. It could be offered as an after-school alternative. The one adjustment was a different instructor from last year.

None.

They went along not having them the first half of the year. They've been pretty flexible.

They've had regular meetings with teachers and me. They seem to be better organized. I think they're doing a good job.

I don't know of any major differences.

Summary of Principal Responses
1987-88 Project SEED Evaluation

PRINCIPAL INTERVIEW QUESTIONNAIRE

1. What purpose does Project SEED fulfill in your school program goals?

I'm less involved with the program than I have ever been. We have the real model with a lot of corporate volunteer specialists. I'm interested in achievement, affect, public relations.

Teachers like the program and a few parents say they appreciate what's being done. It's so limited; there is not enough follow-up. Part of our job is to help kids think, and see problems through. Project SEED compliments Problem Solving in Math (PSM).

Participating in Project SEED fulfills a District requirement.

It does teach higher-level thinking, as well as high-level math. For the majority of kids, it enhances self-concept.

One goal is to spend more time on task in math instruction.

None.

None.

I'm doing this because we have to. We cannot figure out how to correlate it with our goals in basic skills mathematics.

2. Which class/es will participate in Project SEED? How were they chosen?

Fifth graders have to be involved because SEED prefers to work at that level. The fourth grade classes are volunteers. We deal with programs to prepare students to participate a full half year when they are in fifth grade.

Teachers volunteer to participate in the program.

The principal asked a teacher to participate.

Both fourth and fifth grade classes participate. Teachers were interested. Two teachers wanted to continue another year because they thought the program was worthwhile.

New teachers who were not trained were asked by me to participate in the program.

The teacher volunteered.

A teacher volunteered.

I selected a teacher to participate.

3. Are participating classes heterogeneously or homogeneously grouped for Project SEED instruction? Does the regular classroom teacher provide math instruction to the same group of students?

Classes are heterogeneously grouped. Yes.

Heterogeneous. Yes.

Heterogeneous. Yes.

Heterogeneous. Yes.

Heterogeneous. Yes.

Heterogeneous. Yes

Heterogeneously grouped. Yes.

Heterogeneous. Yes.

4. How much time will be spent in Project SEED instruction? (i.e., minutes/day; days/week; weeks/year)

Forty minutes a day, four days a week.

Forty minutes a day, four days a week.

Forty-five minutes a day, four days a week.

Forty-five minutes a day, four days a week.

Forty-five minutes a day, four days a week.

Forty-five minutes a day, four days a week.

Forty-five minutes a day, four days a week.

Forty minutes, four days a week.

5. How much time will be spent in regular math instruction? (i.e., minutes/day; days/week; weeks/year)

Forty to fifty minutes a day, five days a week.

Fifty minutes a day, five days a week.

Forty-five minutes a day, five days a week.

Forty minutes a day, five days a week.

One hour a day, five days a week.

Forty-five minutes a day, five days a week.

Forty-five minutes, five days a week.

Thirty minutes, five days a week.

6. How much time will be spent in Chapter I math instruction? (i.e., minutes/day; days/week; weeks/year)

Forty to fifty minutes a day, five days a week.

Thirty minutes, three to five days a week.

Thirty minutes, four times a week.

Thirty minutes, five times a week. It will soon increase to fifty minutes five times a week.

Twenty minutes a day.

One hour a week. There are no Chapter 1 students in the class.

There are no Chapter 1 students in the class.

7. How is instructional time reallocated to allow time for Project SEED? (i.e., What is being given up? Reading, language arts, social studies, science, other time?)

The teacher takes away a little from all her classes.

Social studies and health.

The teacher will be able to answer that question more accurately.

Mainly science and social studies. We are trying to encourage an integration of the curriculum.

Time is taken from social studies, health and science.

The teacher will know the specifics.

Science, health, social studies.

The teacher will be able to tell you that.

8. What outcomes do you expect as a result of participation in Project SEED?

I expect achievement, affect and public relations effects.

I think the techniques can lead to logical thinking.

More participation by more kids in the SEED situation.

Maybe a more positive attitude toward math. I hope that more of the girls who are exposed to the program will be taking more advanced math classes. It's a confidence-builder and provides exposure so that they don't have to be so fearful.

Possibly some change in RIT scores.

None.

Nothing.

Maybe something will show up.

Math scores. I expect math scores to be 5 to 10 RIT points above everyone else's. That is what our third graders get with a different type of support program.

9. How does Project SEED interface with the regular and/or other supplementary math curriculum and instruction?

It does not.

I have observed the class twice and it seems to be regular SEED without a particular interface.

It doesn't.

The only way I can perceive of an interface is through the problem solving in the regular math program. It is isolated until the teacher gets to a unit with more geometric or algebraic concepts so that the fact that kids have had the exposure all along makes it interface.

I question that it does. I have seen the teacher take non-verbal signals and apply them throughout the school day. I have seen kids looking for greater variety of problems and answers to questions which they possibly might have learned from SEED. Questioning strategies are modeled.

It doesn't.

It doesn't.

It doesn't. It never has. We have asked them to and it still hasn't. They teach the same old exponentiation.

10. What adjustments has SEED made to make the program better serve the needs of staff and students in your school?

SEED came in during the worst teaching time of the day with a difficult group of kids and was willing to offer their program. They have shortened their time to fit our schedule and they have been accommodating.

There are no adjustments that I know of.

They have been flexible about scheduling.

What I like is that they use direct instruction and involve about 80 percent of the kids. They get immediate feedback and are encouraged to take risks. Because there is no grade involved, that might be part of it. Our special education kids participate in Project SEED.

None.

I don't know of any adjustments.

They have made organizational adjustments. We got our first choice on time and an instructor.

None.

1986-87 and 1987-88 Project SEED Evaluation
Interview Questionnaire for
Teachers of "Long-Term" SEED Classes

1. How does Project SEED interface with your regular math program? In terms of curriculum? In terms of instruction?

2. How much scheduled time do you have for whole-class instruction? What instructional time have you reallocated to provide time for SEED instruction?

   Reading:

   Math:

   Language Usage:

   Science:

   Social Studies:

   Other:

3. When and how does the SEED specialist coordinate his instructional delivery with your regular math program? Does this coordination occur during the day on which SEED does not operate in your room?

| Nature of Interaction | Time: Minutes/Days/Weeks | Mode |
|---|---|---|
| Conversation | | |
| Consultation | | |
| Lesson Planning | | |
| Team Teaching | | |
| Small Group Work | | |
| Assistance with Regular Math Program | | |
| Other: | | |

4. What outcomes do you expect for your students as a result of their participation in Project SEED?

5. What have you gained as a result of your observation/participation in Project SEED?

6. What adjustments has SEED made to make the program better serve the needs of students in your class?

Summary of Teacher Responses
to 1986-87 Questionnaire

1. How does Project SEED interface with your regular math program? In terms of curriculum? In terms of instruction?

I don't really think it does for skills they are to know at end of 5th grade. The drill and some motivation portion is below what's expected of 5th grade. This could be good for enrichment.

They're working closely to incorporate with what we're doing in SEED.

It goes along just fine. I love it; the kids love it. The fractions we're doing now--it's sticking. He gives everyone a chance without stress--no one feels he's put on the spot.

He's teaching logic and that fits in with Problem Solving in Math. I share what we're doing in our curriculum and he incorporates that into his teaching.

It does not. The problem I'm having is it takes 45" 4 days/week out of my time and I still have to teach them what the curriculum requires. Does not fit academic curriculum.

We're working on multiplication and division and he reinforces those facts. Students are using signals to answer questions in other classes.

Introductory drill and practice on basic operations; reinforces basic operations. During regular instruction, I refer to SEED experience; not systematically but as it pops up.

He tries to work in some things, e.g., division, the process of multiplication, all the time.

It does particularly toward the end of the year where we're in fractions.

It's excellent in that addition, multiplication and basic facts are drilled and re-drilled. Students can see them in a different light and it's thought provoking.

He took care of fractions, negative numbers and went way beyond.

They compliment each other; we study the basic concepts of what he teaches and he gives the advanced concepts, which is more than they would normally get which is very good.

Both of them can be integrated because it deals with addition, subtraction, multiplication and health. I like the strategies and the way the specialist respects the kids and works with them.

I was able to ask SEED instructors to teach what we were going over in math. He did 10-15 minutes of drill at the beginning. He included Fractions. Who's to say how valuable the SEED content is?

He took care of fractions, negative numbers and went way beyond. We worked at it. We've spent a lot of time on fractions. The specialist used them a little bit every day. He's real quick and understands.

2. **How much scheduled time do you have for whole-class instruction? What instructional time have you reallocated to provide time for SEED instruction?**

3.5 hours/day. I take out more of math, I explain homework--SEED is main math program. Teaching math is a follow-up to SEED. Before October we did review.

3 hours/day. Science a little of everything.

I don't know; sometimes on Thursdays 5 kids are out of SEED. Reading/Language Arts block.

I have the class all day. 15 minutes out of language; I've almost eliminated spelling. 10 minutes out of math. 15 minutes out of reading.

Heterogeneous group--group is usually here except for special help in mornings and ERC. I take from social studies, science, health.

I take a little out of everything, mainly social studies. ERC kids are not participating.

All but 1 hr/day. I was very jealous of this time; if I don't see this moving ahead, I will say so. When I have new students and he tries to catch them up, it is frustrating and he is boring my class. I told him, we've got to keep moving and not bore the class. Silent reading (20"); also deleted class meetings, and compressed other subjects.

Does not teach math to same group but does teach over half of them--about 2 hrs/day. Reallocated from italic, health, art -- mostly social studies.

I take it out of math; it's the only time I could try to fit it in.

5 hours. French.

About 3 hours. I took 1 hour out of math; I supplemented math 30"/day.

4 hours. I took silent reading time.

3 hours. I mostly juggled social studies and science and health.

About 3 hours/day. Health.

3 hours. I integrated language and writing on alternate days.

3 and a half hours a day. Out of math, science, a little of everything.

3. **When and how does the SEED specialist coordinate his instructional delivery with your regular math program?**

We talk about what I'm doing--every two weeks after school or during planning for 20-30 minutes.

I told him I was getting into fractions and he coordinated it. We talk about 20 minutes/week (before or after class). I try to find homework that will be a follow-up of SEED math.

We talk 10-15" every 2 weeks. It's informal.

We talk 10-15 minutes/week. He asks where they are in math.

3-4 times/week, 30-40 min.

We have talked 3-4 times.

Conversation 5"/week avg.; we have an occasional conversation.

I gave him my topics and he'd drill on those. Once a week during my preparation we met for about 20". Communication was very open.

Conversation. We met about once a week for 15" during my prep time.

He doesn't.

There is absolutely no planning between SEED and me as with the administrative assistant who also works with my class in math (a couple of times a week).

We haven't discussed it. I attend his classes but he doesn't attend mine. Probably none.

I talk to him once in a while, e.g., 10 minutes a week--sometimes during lunch, sometimes during my prep time.

He didn't -- he just did it. He is excellent.

We met once a month for about an hour after school.

I showed him at the beginning of the year what I would teach -- sometimes I observe and sometimes I don't.

4. **What outcomes do you expect for your students as a result of their participation in Project SEED?**

When they come across something new, they might have more interest in figuring it out (thinking skills). Maybe confidence-building for lower kids.

To have a great deal of appreciation for math and for higher concepts that wouldn't be present in a regular class setting.

I expect them to feel comfortable doing harder skills like division, multiplication, adding/subtracting/multiplying fractions.

Good problem-solving skills; a liking for mathematics.

There should be a marked improvement in their self-concept.

Mainly for them to enjoy math.

To learn how to reason; to use logic and reasoning.

I expect that verbal communication skills and self esteem will be raised and their listening abilities improved.

I expect some reinforcement of the basic skills and I expect kids in the past who were discouraged about math to not be discouraged.

I think most of them are going to have a better understanding of the algebraic terms and process, in an abstract way.

Better understanding of math concepts.

That students would get a different view and approach to math.

I expected higher test scores -- the kids can benefit because it involves everybody. Some kids were fearful of attacking problems.

They'll be real comfortable with reasoning skills and math.

I know they'll be better prepared to handle algebra when faced with it. SEED's positive approach helps more kids express themselves.

To have better concepts and a liking for the subject; to know that the subject can be taught in different ways.

5. What have you gained as a result of your observation/participation in Project SEED?

Some insight into which students do and don't respond to the process. I can carry over hand signals into their classes. My top kids are bored.

I've had the opportunity to see different presentations and how the children react to other individuals in their presentations.

Some easier approaches to presenting a lesson--e.g., the signals where I can include everybody; where they can respond as a group.

Some algebra I didn't know about before.

Some methods, e.g. signals for agreement, disagreement, group response.

The way they run the program; how to teach but to make it fun.

I already knew the hand signals. I don't think I've learned anything new.

I've picked up on some of his methods; some work, some don't (for both of us). My knowledge of algebra is coming back.

I learned summation notation.

I discovered that every student was included, participated, and met success.

I saw a lot of participation and problem solving. I took some of SEED's questioning techniques.

A lot of math knowledge; it beefed up expectations. A couple of kids (I couldn't believe it) really perked up.

The biggest thing is I've tried to involve the total class, regardless of level. They all get to work on the level where they are in the concepts he's teaching at any one particular time.

I like the strategies he uses, e.g., hand signals.

I gained lots of techniques/signals -- I picked that up a long time ago -- giving examples and letting kids infer. I also used that before though it's wonderful to see it reinforced. I haven't done these things so much in math and I am delighted to see it there. SEED was fun for them.

More ideas in methods; involving students; chance to sit back and look at what's going on in kid's head and realizing that could be happening when I'm teaching a lesson. It's a chance to get to know them better to see how I could help them.

6. **What adjustments has SEED made to make the program better serve the needs of staff and students in your school?**

I asked him to not stay on the same thing for so long. They haven't responded noticeably. They're patronizing--jumping up and down because kids can add 2 + 2. I have higher expectations.

I've spoken to him--I have some children with emotional problems and we've talked about ways to handle them. Sometimes we have three specialists in the room once or twice to give special help.

He's going a little slower than I would go. He makes sure that everybody understands. I have them make notebooks, and I have one too.

I wouldn't know. I am pleased with the specialist; our teaching styles are much the same. I hope the kids can have it another year.

I've told him if he waits he'll lose them, and he has. The specialist has gone way too slow. It's going to end at the semester.

They're servicing more classrooms.

The specialists are extremely flexible.

The specialists are extremely flexible.

This is a better teacher, instructor (than the one I observed as a substitute last year).

I've asked them to get certain kids more involved and they've tried to do that. I know the kids a little better than he does. I'd like to see them move along a little faster. Sometimes they drill upon one thing too long.

The specialist has responded to my suggestions, e.g., doing cross products (it may have been part of his program anyway).

The SEED specialist adjusted his schedule to meet our needs.

They pulled him in (the corporate volunteer).

Not applicable; the way they do it is fine. I think we complement each other's approach.

I begin to see my kids begin to get bored. They needed activities, hands-on, and when I told him he did that and they loved it. I think SEED depends on the instructor. I like the way he respects the students in my class.

I was able to ask him to teach what we were going over and he did 10-15 minutes of drill at the beginning.

Summary of Teacher Responses to
1987-88 Project SEED Evaluation
Interview Questionnaire for
Teachers of "Long-Term" SEED Classes

1. How does Project SEED interface with your regular math program? In terms of curriculum? In terms of instruction?

The algebra which students experience in a positive way reinforces the regular math program. Skills are learned on an advanced level. Instruction is done as a total group with individual help when necessary.

He went all through fractions. He met fractions, multiplication and division needs. He introduced thinking strategies.

The specialist has been very open to meeting with me to coordinate our curriculum. He has come to tutor five or six kids on the fifth day to help kids who are needing extra assistance.

In terms of teaching style, it's fine. In terms of curriculum, it is outside the curriculum of the District.

Working with the corporate volunteer specialist, she has asked quite a few times exactly what we are doing in our class. I cover what is in the book and she tends to use a different approach to teach, like fractions. I dealt with what was in the book, the basics, and she brought in different ideas. We kind of worked together.

In Project SEED, he has done some of the same basic skills that I've been teaching in the classroom. It reinforces.

They came in the fall for nine weeks and I requested more time because another school cancelled out. It's an excellent supplementary program because they do a lot of addition, subtraction, multiplication and fractions.

We have been talking about them following the same kinds of patterns in the math subject we are doing.

There is very little interface. That's one of the drawbacks. It has been difficult, and the children tend to get confused because they are working on two or three concept levels at the same time and it's hard to have it with regular math for a long-term basis. Correlating the concepts might be of help. In March, I decided not to have my regular math group on a daily basis because it was too confusing. So we basically went more to problem-solving activities rather than the computational activities in the basic series.

When we had it, it helped children to understand basic arithmetic skills. We split our time with another fifth grade class.

It doesn't.

It doesn't.

It helps to introduce and reinforce subjects that I'm teaching.

It does not.

It's fine. We confer on what we're covering. He reinforces that.

2. How much scheduled time do you have for whole-class instruction? What instructional time have you reallocated to provide time for SEED instruction?

Two and a half hours. Reallocated health and social studies.

I have about four hours in whole-class instruction. I took time out of spelling. We had SEED all year. I wouldn't do it again. It is so structured that it is too much, though the specialist did a good job.

I have four and one-quarter hours. I took the time from math and language.

I have about three and one-half hours and I took the time from science.

I have three hours a day for whole-group instruction. I took time from science, social studies, sliced literature out of reading, and tried to put concepts into other subjects.

Four to five hours. I had to switch around a lot of things. Basically, I took time out of my language arts block.

I have three and one-half hours instructional time. I took time from journal writing. I tried to blend it into afternoon activities.

I have about one hour a day. I took the time out of math.

I have four and one-half hours a day and I took time from extra language arts, i.e., writing activities.

I have about five hours of whole-group instructional time. I took time out of regular math.

I have three and one-half hours. I took time from problem solving and math.

I have six hours of whole-group instructional time. I took time from science.

I have about two hours of whole-group instructional time. I took time out of health.

Two and a half hours; I sort of adjust as we go along and take turns cutting subjects.

3. When and how does the SEED specialist coordinate his instructional delivery with your regular math program? Does this coordination occur during the day on which SEED does not operate in your room?

We talked regularly about half an hour a week, before and after school.

We spent 10 minutes daily discussing the regular math program. We had monthly meetings and I participated in the SEED classroom instruction on a daily basis.

It is sort of informal, three to five minutes daily or 10 to 15 minutes every two weeks. We talked after school and had phone conversations about once every quarter.

I told them at the outset of my scope and sequence, and when they made no effort to integrate their program with mine, neither they nor I have discussed it since. It did not dove-tail into what I was doing.

When I initially talked with them, I understood that some coordination would happen. They take so long and there is so much repetition that it did not happen. They did not move on from what they were working on in the beginning. I met when he wanted to talk to me. I arranged for a paraprofessional to take my class to speak with them. I requested a meeting because of the students' negative behaviors.

It was not a real sit-down meeting. We had informal conversations. If we were going to a new area of study, we talked after one of his sessions.

We talked at the end of class about scheduling. He varies his free day.

They're always asking what you are doing or I follow-up and ask them to stress more of something I am doing. We met twice a week for five to ten minutes right after he was finished teaching for informal conversations.

We had informal conversations two or three times a week for five or ten minutes.

No. He seemed to have things -- it is a laid-out program that is very hard to change. He is very good with the kids and knows many ways to explain the same concept. I was coerced to having SEED. The kids who had it last year were hard to motivate. We had to have class meetings in order to get the class rolling. It took about four months. It is not a good class when half have had it already and half haven't. I participated in an orientation four years ago for two months. It was short-term, new as a model and the kids shined. On a long-term basis, it would be better in middle school settings where it could support the curriculum that is already there. I wanted the program to be a success and provide the best environment for SEED. I sat down and encouraged the kids. A middle school where algebra is going on, the concepts would last longer. They don't have anything to relate to on a long-term basis at this grade level.

No, it just worked out.

No, we do meet and I have made suggestions about things we work on, but for the most part he has stayed with his own curriculum.

She laid the foundation for multiplication, did core work on division, and reinforced fractions. We had informal conversations about 15 minutes long after sessions, occasionally.

We talked after school in phone conversations once a quarter.

We don't coordinate.

4. What outcomes do you expect for your students as a result of their participation in Project SEED?

Students will have more positive self-image. They will also be able to succeed academically in higher level math classes.

I hope they see math as being easier. I think they discovered some thinking and questioning strategies. I hope algebra won't frighten them.

More willingness to problem solve, better test scores. I've seen less frustration with problems and hope for more willingness in high school to go into higher math. I think it has done a lot to disspell their dislike for math. I like the program very much.

My class came unglued during SEED. They are very sharp, well behaved, and motivated. The SEED management style is the opposite of mine. I don't ignore off-task behavior. I don't point it out continually and draw attention to kids who are acting out. I was never able to communicate that with them. They did just the opposite of what I would have wanted. Bright, intolerant students got the majority of attention. I asked if they would like to get low performing kids to have more opportunities. SEED reinforces poor behavior and low concepts and reinforces bad behavior of the top kids. It is very hard when you first teach to participate in a program like this.

Top students will be reinforced for problem-solving skills. I don't expect much from my lower-performing students.

Let's say their thinking process. The specialist questioning methods really got them to use their heads.

I expect them to be able to master the skills that have been taught during SEED.

To not be afraid of math.

My expectation is to see that there is a variety of ways of learning math and enjoying math without the pressures put on them like I put on them. They do not teach as rote as I do.

An easier time in junior high and in algebra.

I'm worried about the Levels Tests. I don't think it helped much. I had my reservations. It is a great show. There was another person who we did not want as a specialist who had initially come to visit a lot. I rearranged my room so that he would not be able to visit as often. The specialist we had is the best one and has great energy. I expected that my kids would have perseverance through the year. What hurt was because of having kids who had it explain it to others. It was a disaster. Those that knew things tried to prod the specialist along more rapidly. I was satisfied with their interests, some motivation and happy if we could maintain their interest when the specialist was gone. From this I hoped for a basic feeling of excitement.

I think several of them -- more likely the top students -- are getting a better understanding of what math is all about. Though sometimes some of the lower Chapter 1 students will surprise you.

A better understanding about math and the function of math. To try to get some of the fear out of algebra and higher math.

I'd hope it would improve their attitude towards math and whole articulation with problem solving.

What I expect is that it will help students with their logic, develop their thinking processes, enable them to analyze and generalize information. I like the notation which I expanded on, and my enrichment activities are similar.

5. What have you gained as a result of your observation/participation in Project SEED?

I have developed a more positive approach in terms of instruction throughout the curriculum.

Gained the ability to use the questioning techniques and look at kids differently. My expectations go up.

I've gained some new insights into math.

I've affirmed the need to monitor visually. For example, by walking the room, using hand signals, pointing to problems on the board.

No response.

No response.

I would say my questioning techniques.

One of the things I've really enjoyed this year is watching the presentations and certain techniques he has used to get children's attention. For example, hand signals.

An easier way of teaching adding and subtracting fractions.

That math can be fun, that math isn't a lot of book participation, that it is a new approach to teaching math.

Another way of communicating. Another insight into math that I might have never used.

It has been -- in that I was able to develop cohesiveness and support the kids to get the specialist to move on. They know that it is expected that they sit up, be ready, attend. I would rather not do this again if given the chance.

A better understanding of higher math. I was scared to death of algebra, but now I appreciate it more.

Some familiarity with Socratic method. I learned about my students' individual learning styles, a commitment to participation, their habits, who's willing to take notes, and so on.

During the first year I observed some teaching techniques.

6. What adjustments has SEED made to make the program better serve the needs of staff and students in your school?

SEED works with the classroom teacher in problem-solving strategies, instructional techniques, and parent conferences.

They were real good about adjusting their schedule.

On occasions they have made some adjustments in schedules.

He is very flexible.

I take a good deal of responsibility that I did not take a more active role in directing them. Though they wanted the teacher to be totally involved, it was in a way contrary to my beliefs. I do not handle students authoritatively. It is not a system. One day the students said good afternoon in Spanish and the specialist left the room until they would say it to him the "right" way, in unison and English. He had to leave twice. I expected them to say it to him in English, but he had set them up for that kind of defiance.

No Response.

I have been satisfied with what the specialist has planned.

I do have children that come in tardy. I encourage them to go quickly to their seats and get out the three things they need to have ready for SEED class; pencil, notebook and paper.

I haven't asked them to make any adjustments. The class is too long and they lose the kids toward the end because it is so active and demands a lot of energy.

They adjusted their time, schedule, the levels of academics. If they didn't feel the kids were at a certain standard, they covered more basics. We talked about changes in the beginning.

No adjustments. It's just like going to college. The professor speaks. I thought it was nice that he went to an OMSI field trip with us and to the Imagination Celebration, and he tried to tie that experience into his classroom presentations.

No. They were pretty able to adapt to kids.

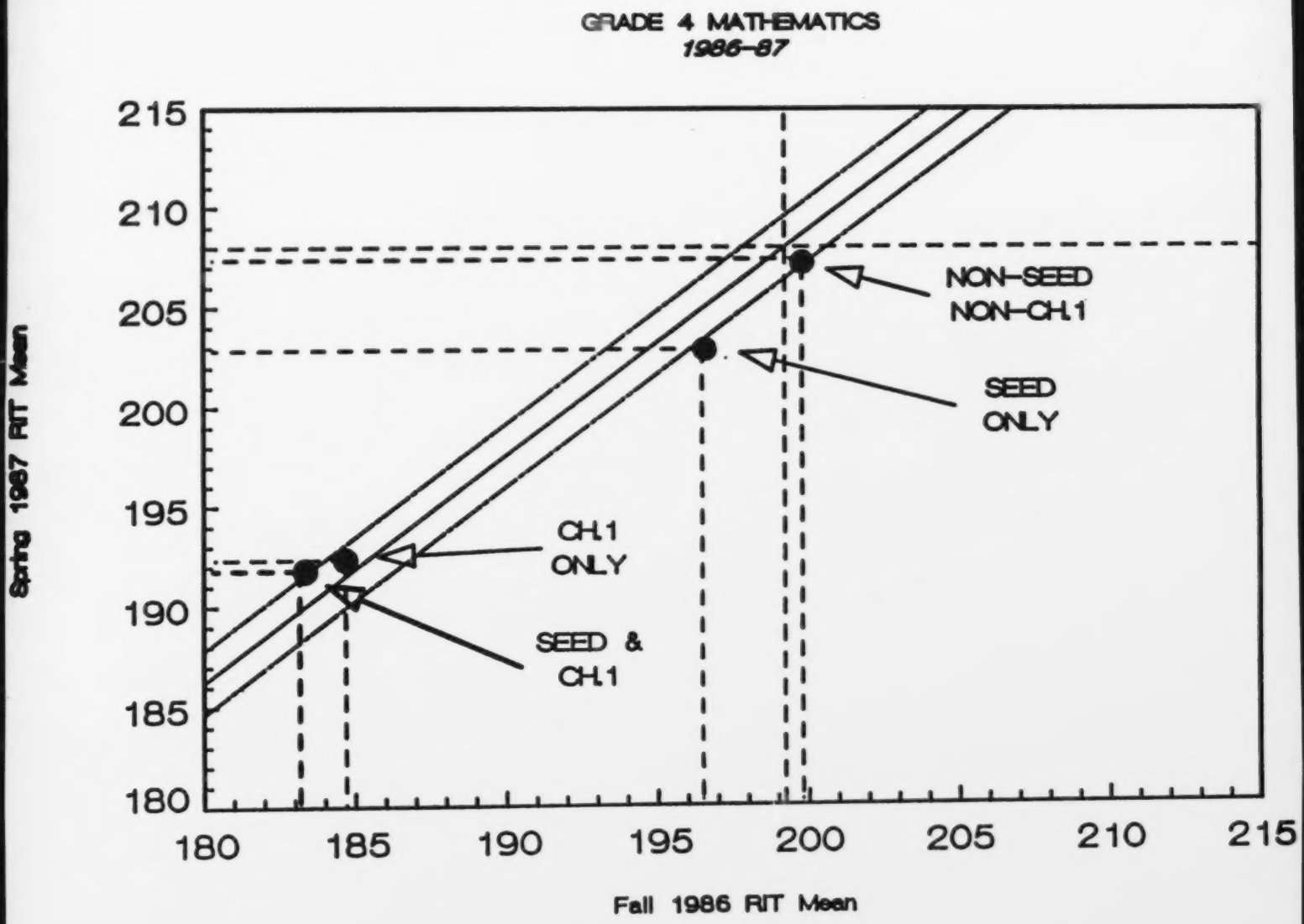
No. Every time I have asked for an adjustment they have said no. The style that they use is limited in the scope of learning styles. Children can learn by rote, but they cannot incorporate a level of comprehension to use in other situations. Kids who are able to participate can have a rich experience.

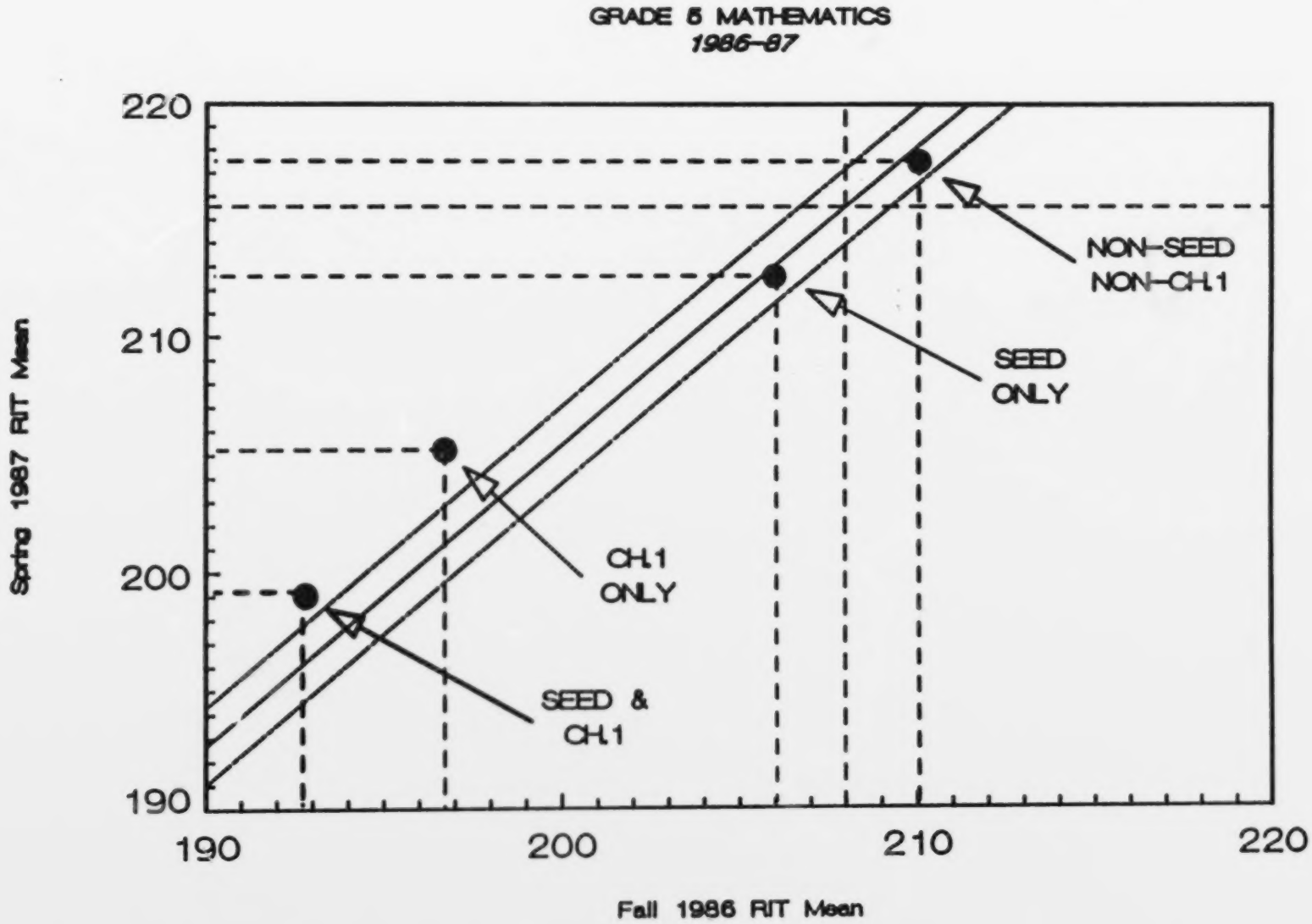
I felt they did. They had to modify to meet the kids' needs. The kids were in need of pre-skills for multiplication.

On occasions they've made some adjustment.

APPENDIX B

o Achievement Graphs


GRADE 4 MATHEMATICS
1986-87
215
210
205
200
195
190
185
180
Spring 1987 RIT Mean
NON-SEED
NON-CH.1
SEED
ONLY
CH.1
ONLY
SEED &
CH.1
180
185
190
195
200
205
210
215
Fall 1986 RIT Mean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Spring 1987 RIT Mean
Fall 1986 RIT Mean
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SEED
ONLY
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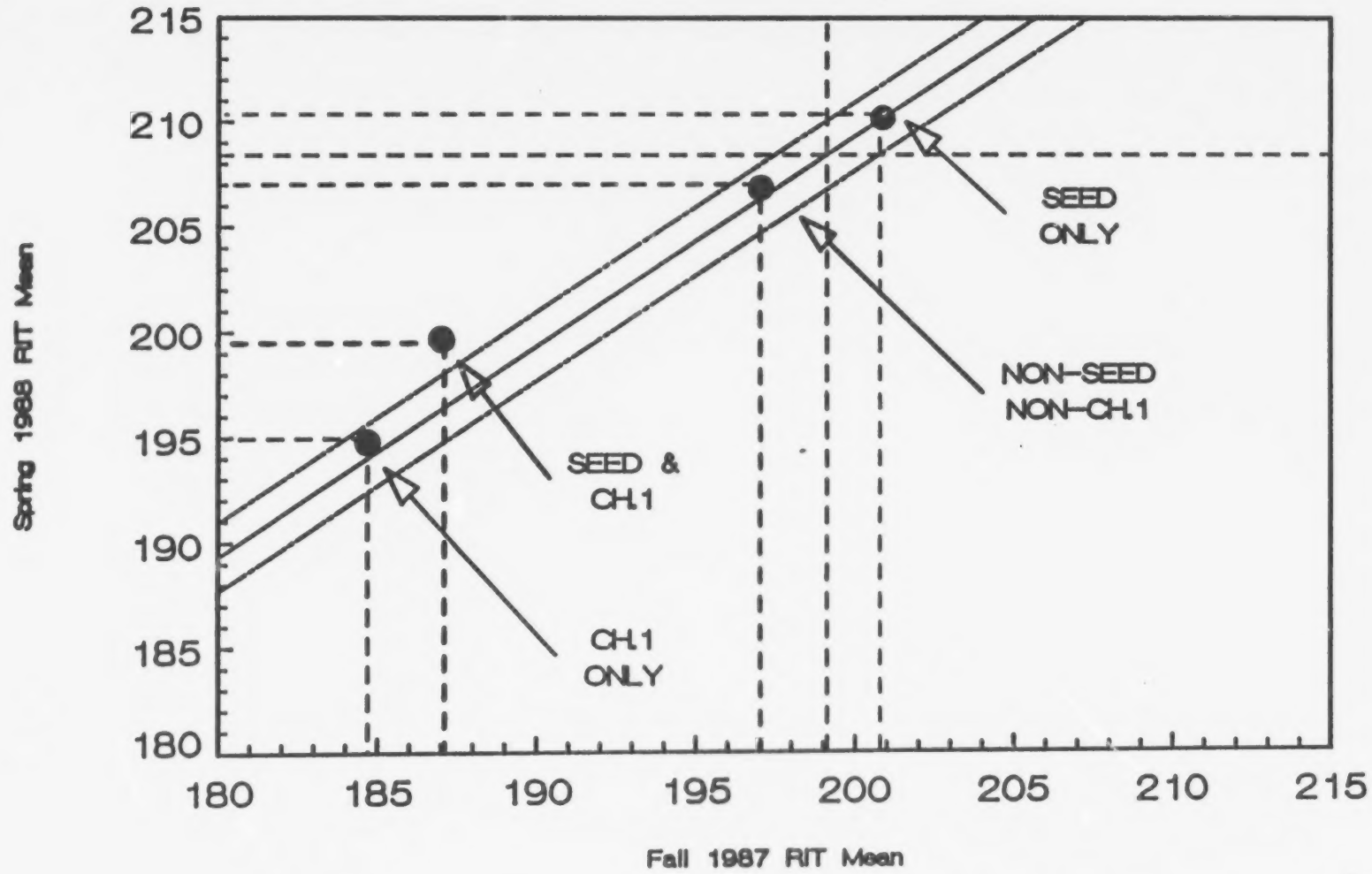
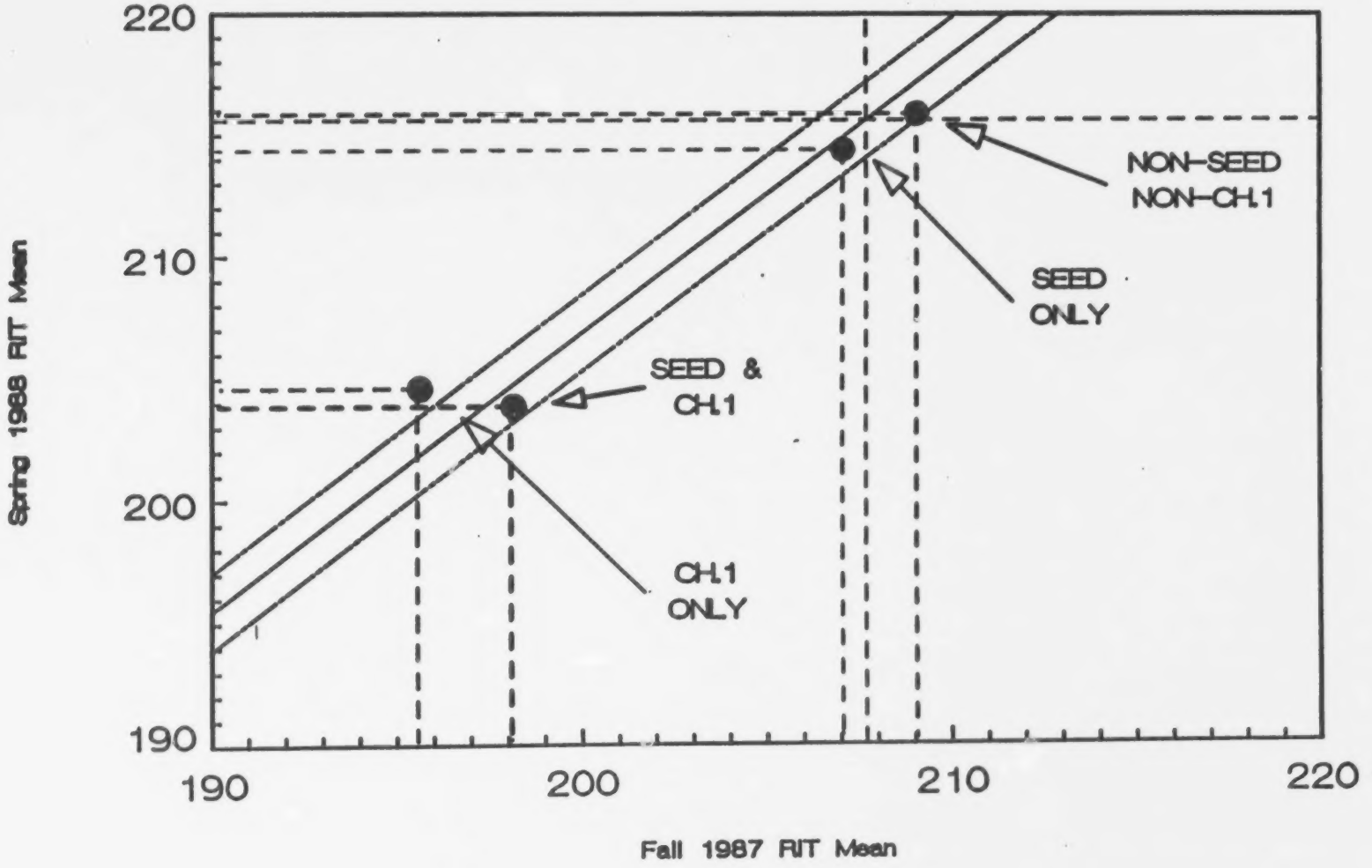
ONLY
SEED &
CH.1

GRADE 4 MATHEMATICS
*1987-88*



GRADE 5 MATHEMATICS
*1987-88*



APPENDIX C

- Project SEED Observation Checklist
- Summary of Observation Data

1986-1987

# PROJECT SEED OBSERVATION CHECKLIST

Observer _____ Date/Time _____ Specialist _____ Grade _____ School _____

## MATHEMATICS CONTENT/EMPHASIS

- Exponentiation _____
  - Factor forms; bases _____
  - Equivalent forms _____
  - ALFE _____
- Basic skills drill _____
- Fractions _____
- Related discussion topics:
  - Numerical values _____
  - Variables; Greek letters _____
  - Sentences _____
  - Inverse operations _____
  - Negative numbers _____
  - Identity element _____
- Other: _____

## NATURE OF STUDENT RESPONSE

- Oral drill, operations _____
- Fixed response _____
- Repeating answer/reading _____
- Calling on other student _____
- Reading _____
- Recall, recite rule _____
- Giving number to start a problem _____
- Original question, comment _____
  - Guess _____
  - Recall general information _____
- Explanation _____
- Other: _____

## SEED TECHNIQUES

### Feedback/Involvement

- Hand signals _____
- Finger signals _____
- Hand count _____
- Chorus responses _____
- Repeating responses _____
- Deliberate error _____

### Build Confid./Success Reint.

- Student calls on other student _____
- Student to board _____
- Star problems _____

### Focus for Feedback/Involvement Content Reinforcement

- Involve teacher _____
- Stop eraser/chalk _____
- Rapid questions/drill _____
- Other: _____

OTHER OBSERVATIONS:

PROJECT SEED
FREQUENCIES OF OBSERVED TECHNIQUES

| Catetory | Class Number | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | % | 2 | % | 3 | % | 4 | % | 5 | % | 6 | % | 7 | % | 8 | % | 9 | % | 10 | % | 11 | % | 12 | % | 13 | % | 14 | % | 15 | % | |
| Chorus Responses | 5 | 3% | 2 | 1% | 4 | 3% | 12 | 8% | 16 | 10% | 20 | 13% | 9 | 6% | 13 | 8% | 17 | 11% | 4 | 3% | 15 | 10% | 9 | 6% | 18 | 12% | 7 | 5% | 2 | 1% | 153 |
| Hand Signal | 4 | 5% | 2 | 3% | 2 | 3% | 5 | 6% | 3 | 4% | 8 | 10% | 6 | 8% | 6 | 8% | 9 | 12% | 12 | 16% | 4 | 5% | 3 | 4% | | | 9 | 12% | 4 | 5% | 77 |
| Finger Signal | 1 | 3% | | | 4 | 11% | 4 | 11% | 3 | 8% | 4 | 11% | 1 | 3% | 7 | 18% | 4 | 11% | 4 | 11% | 3 | 8% | 1 | 3% | | | 1 | 3% | 1 | 3% | 38 |
| Student Calls Peer | 2 | 13% | | | 1 | 7% | 3 | 20% | | | 1 | 7% | 2 | 13% | | | 2 | 13% | | | | | | | 1 | 7% | 2 | 13% | 1 | 7% | 15 |
| Student to Board | 3 | 20% | | | 1 | 7% | | | | | | | 1 | 7% | | | 1 | 7% | 3 | 20% | 2 | 13% | 1 | 7% | | | 1 | 7% | 2 | 13% | 15 |
| Hand Count | | | | | | | 1 | 8% | 2 | 17% | 1 | 8% | 4 | 33% | 2 | 17% | | | 1 | 8% | | | 1 | 8% | | | | | | | 12 |
| Stop Eraser/Chalk | | | | | 1 | 11% | 2 | 22% | | | | | 1 | 11% | | | 3 | 33% | | | 2 | 22% | | | | | | | | | 9 |
| Deliberate Error | | | | | | | | | 1 | 25% | | | 1 | 25% | 1 | 25% | 1 | 25% | | | | | | | | | | | | | 4 |
| Star Problems | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 50% | 1 | 50% | 2 |
| Repeat Responses | | | | | | | | | | | | | | | | | | | | | 1 | 100% | | | | | | | | | 1 |
| Involve Teacher | | | | | | | | | | | | | 1 | 100% | | | | | | | | | | | | | | | | | 1 |



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PROJECT SEED
STUDENT RESPONSE CATEGORIES

| Category | Class Number | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | % | 2 | % | 3 | % | 4 | % | 5 | % | 6 | % | 7 | % | 8 | % | 9 | % | 10 | % | 11 | % | 12 | % | 13 | % | 14 | % | 15 | % | |
| Chorus Responses | 5 | 3% | 2 | 1% | 4 | 3% | 12 | 8% | 16 | 10% | 20 | 13% | 9 | 6% | 13 | 8% | 17 | 11% | 4 | 3% | 15 | 10% | 9 | 6% | 18 | 12% | 7 | 5% | 2 | 1% | 153 |
| Hand Signal | 4 | 5% | 2 | 3% | 2 | 3% | 5 | 6% | 3 | 4% | 8 | 10% | 6 | 8% | 6 | 8% | 9 | 12% | 12 | 16% | 4 | 5% | 3 | 4% | | | 9 | 12% | 4 | 5% | 77 |
| Finger Signal | 1 | 3% | | | 4 | 11% | 4 | 11% | 3 | 8% | 4 | 11% | 1 | 3% | 7 | 18% | 4 | 11% | 4 | 11% | 3 | 8% | 1 | 3% | | | 1 | 3% | 1 | 3% | 38 |
| Student Calls Peer | 2 | 13% | | | 1 | 7% | 3 | 20% | | | 1 | 7% | 2 | 13% | | | 2 | 13% | | | | | | | 1 | 7% | 2 | 13% | 1 | 7% | 15 |
| Student to Board | 3 | 20% | | | 1 | 7% | | | | | | | 1 | 7% | | | 1 | 7% | 3 | 20% | 2 | 13% | 1 | 7% | | | 1 | 7% | 2 | 13% | 15 |
| Hand Count | | | | | | | 1 | 8% | 2 | 17% | 1 | 8% | 4 | 33% | 2 | 17% | | | 1 | 8% | | | 1 | 8% | | | | | | | 12 |
| Stop Eraser/Chalk | | | | | 1 | 11% | 2 | 22% | | | | | 1 | 11% | | | 3 | 33% | | | 2 | 22% | | | | | | | | | 9 |
| Deliberate Error | | | | | | | | | 1 | 25% | | | 1 | 25% | 1 | 25% | 1 | 25% | | | | | | | | | | | | | 4 |
| Star Problems | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 50% | 1 | 50% | 2 |
| Repeat Responses | | | | | 1 | | | | | | | | | | | | | | | | 1 | 100% | | | | | | | | | 1 |
| Involve Teacher | | | | | | | | | | | | | 1 | 100% | | | | | | | | | | | | | | | | | 1 |







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APPENDIX D

- "Attitude Toward Mathematics" Survey Questionnaire
- Student Interview Questionnaire

School _____

Name _____

| Practice statement: I really want to do well in mathematics. | True about me | Sometimes true about me | Not true about me |
|---|---|---|---|
| 1. I am good at working with numbers. | True about me | Sometimes true about me | Not true about me |
| 2. I usually understand what we are talking about in mathematics. | True about me | Sometimes true about me | Not true about me |
| 3. I feel good when I solve a hard mathematics problem by myself. | True about me | Sometimes true about me | Not true about me |
| 4. Mathematics is fun for me. | True about me | Sometimes true about me | Not true about me |
| 5. Mathematics is boring for me. | True about me | Sometimes true about me | Not true about me |
| 6. Doing mathematics makes me nervous. | True about me | Sometimes true about me | Not true about me |
| 7. Working with numbers upsets me. | True about me | Sometimes true about me | Not true about me |

## Data Included in the Exercise Set[1]

In Appendix A of this volume, estimates of national p-values are reported for each foil of each part of every effective exercise. These data are placed directly on copies of the exercises. To provide room for the data the response ovals (foils) used by the respondents were removed. A column of data labeled "no response" is provided for each exercise part. This data is an estimate of the percentage of respondents who did not respond to the exercise part in question. However, "no response" was not a response option for an exercise.

A few of the exercises in Appendix A have relatively high nonresponse rates. These high nonresponse rates seem to be, at least in part, due to exercise placement within the package.

For exercises given to both ages 13 and 17, the data is presented on two lines. On all these exercises the age 13 data is given on the upper line and the age 17 data on the lower one.

Correct answer estimates of p-values are provided for cognitive items. These estimates are included as Appendix C, which contains data for the nation and modal grade.

Statistics reported and definitions of the selected population groups follow.

## Statistics Used in the Exercise Set

Since National Assessment uses a national probability sample to collect data, the findings are reported as estimates of the percentage of individuals in a given group who would successfully complete a particular exercise if everyone in that group in the country had been tested. Thus, when we say that "85 percent" of the 9-year-olds gave correct responses," 85 percent is an estimate of the proportion of all 9-year-olds in the country who would have answered correctly if all 9-year-olds had been assessed.

These percentages are always subject to sampling error since they are computed from a sample rather than from the entire population. The standard errors of these percentages provide a measure of the sampling variability among all possible samples. The standard error of a sample statistic can be used to construct a confidence interval for the estimate—for example, the interval from two standard errors below to two standard errors above the particular sample value would include the average of all possible values in about 95 percent of the samples.

Standard errors for the p-values contained in Appendix C of this release exercise set can be estimated using a pair of formulas given below. For a simple random sample the standard error of a p-value is

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[1] From National Assessment for Educational Progress for Mathematics, Released Math Exercises. Denver, Colorado: Education Commission of the States, June, 1975.

For National Assessment data the following equations should be used to obtain reasonably accurate estimates of the standard errors.

If $30\% \leq P \leq 70\%$ then

$$se_p = \sqrt{\frac{2P(100-P)}{n}}$$

If $P < 30\%$ or $P > 70\%$ then

$$se_p = \frac{32.4}{\sqrt{n}} + \sqrt{\frac{P(100-P)}{2n}}$$

For both equations:

P = weighted percentage

$se_p$ = estimated standard error of the percentage P

n = sample size

The approximate sample sizes for the nation and modal grade are given for each age in Table 1.

TABLE 1

Approximate National and Modal Grade Sample Sizes for the 1981-82 Mathematics Assessment by Age

| | Age 9 | Age 13 | Age 17 |
|---|---|---|---|
| National | 1992 | 1970 | 2040 |
| Modal Grade | 1398 | 1407 | 1511 |

## Definitions of Selected Reporting Groups

In addition to results for the nation as a whole, National Assessment reports performance of various groups within the national population. Definitions of the groups reported in this volume follow.

### Age

Results are reported for all persons enrolled in public or private schools who were 9, 13 and 17 years old at the time of the assessment.

## Modal Grade

The modal grade is the school grade in which most (70 to 75 percent) students in a specific age group are found. The modal grades for each age group are: age 9—grade 4; age 13--grade 8; and age 17--grade 11.

A state or district that conducts an assessment of grades 4, 8 or 11 and tabulates results separately for students who are 9, 13 or 17 years old (according to National Assessment's age definition) will be able to compare its results to National Assessment's modal-grade results.

1987-88 PROJECT SEED EVALUATION
STUDENT INTERVIEW QUESTIONNAIRE

Name: _____

School/Grade: _____ Teacher: _____

1. Tell me about your math classes this year. What kinds of things are you studying in math?

   Are you learning about math in any other classes besides the one taught by your regular teacher?

2. I understand you are in (SEED math, algebra, or Project SEED). Tell me about it. What kinds of things are you learning about in (SEED math, algebra, or Project SEED)?

   Tell me about your (SEED math, algebra or Project SEED) notebook; what kind of information do you write in your notebook?

3. How does what you do in (SEED math, algebra, or Project SEED) fit with other things you're learning about math?

4. How do you like (SEED math, algebra, or Project SEED)? Would you like to be in (SEED math, algebra, or Project SEED) next year?